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Louisiana Conservation REVIEW

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Chief Biologist, Louisiana
Department of Conservation

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Director of the Oyster Division
of the Louisiana Department
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JULY
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JAMES P. GUILLOT..........Editor
N. E. SIMONEAUX..........Assoc. Editor
ESTELLE V. COTTMAN......Nat. Guar. Ed.

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State Parks

THE present administration of the Louisiana Department of Conservation has been interested in the establishment of a State Park system since it first assumed office, nearly five years ago. The creation of a State Parks Commission of Louisiana is proposed in House Bill No. 465 by Mr. C. A. Morvant of Lafourche Parish, now pending before the legislature in regular session. The said bill was prepared and sponsored by this department.

Favorable editorial comment on this measure from the New Orleans Item is reproduced below:

A bill by Representative Morvant would create a state parking commission. A parking commission which might start in an advisory capacity, without salary, has been advocated by us for some time. It is very distinctly in line with Federal policy. National parks are created for forest reserves. An effort is to be made to bring scientific forestry to the United States. The introduction of scientific forestry would mean that vast sections in the states of Louisiana and Mississippi which now constitute eyesores in the shape of cut-over lands would be turned into forests from which this country would draw a perpetual wood supply.

Very few countries are as richly blessed with forests as the United States is. Yet Germany, Finland, Norway and Sweden as well as other European countries maintain a permanent supply of wood pulp which they make into paper and all other wood-products cheaper than we can, despite our once-imperial forests.

We don't suggest that the State Parking Commission control our state forests. But an intelligent, non-political commission would serve in many ways to conserve our natural resources and could help make life more pleasant and better for the most of us.

Some fine work has been done by the Conservation Commission in establishing fish-hatcheries throughout Louisiana. Governor Allen is enthusiastic for a plan of his own for more fishing-grounds in the State. These, properly cared for, constitute a type of state parks.

A commission of this kind might not only interest the Federal government in establishing national parks in Louisiana, but it should interest the well-to-do in acquiring historic beauty spots and in promoting the general beautification of the State, in cooperation with towns, cities and parishes.

(Continued on Page 56)

Help for Oyster Farmers

UNDER the above caption the New Orleans Times-Picayune comments editorially, June 30th, on the passage by the House of Representatives of the U. S. Senate Bill authorizing the creation of production credit associations to make loans to oyster planters.

This Bill will afford timely aid to Louisiana oyster planters whose crops have been damaged during the past year not only by unfavorable weather conditions, but also by water pollution, attributed to mineral development on the Louisiana Gulf Coast. The editorial follows in full:

Oysters are grown from "seed," so it is not entirely out of reason that raising of the well-known "luscious bivalve" should have been placed in a measure under control of the farm credit administration. Of course oysters are not exactly a line of agriculture, but the growth and distribution of that national product are near enough to that of fruit, tubers and cereals for the government to have extended to associations exploiting the oyster reefs the same helping hand, in the form of national credit, that has given hope to the distressed farmer of dry-land crops.

On June 15 the U. S. Senate bill authorizing the creation of production credit associations to make loans to oyster farmers, better known as oyster planters, was acquiesced in by the House and was sent to the White House where its confirmation was expected via the President's signature.

Under the act, federal intermediate credit banks will be allowed to discount obligations of the Oyster Production Credit Associations, which will function under the regulations issued by the governor of the farm credit administration. Louisiana, as perhaps the most up-and-coming oyster region in the U. S. A., should be advantaged by the new measure.

KNOW YOUR BIRD NEIGHBORS

FEW avenues to the study of wild life offer such attractions and rewards as does the study of birds. Louisiana is exceptionally blest with abundant, interesting, and spectacular bird life, some knowledge of which should be a possession of every one who is fond of the out-of-doors.

Birds, in a world often made less lovely by man's manifold devisings, afford a subject, whose contemplation, available to all, brings so often a keen yet serene interest which is, indeed, wholesome. It is not by any means proposed, that the study of the life and habits of the cuckoo supersede researches into the intricacies of contract bridge, but the thesis is presented as worthy of consideration that some elementary knowledge of the remarkable bird life of our State will widen the horizons and sharpen the pleasures of every walk afield.

Birds have peculiar biological characteristics. A compact group, they possess so many structural similarities to that superficially very different group, the reptiles, that many zoologists have associated both birds and reptiles in a single group, the Sauropsida. Unlike all other animals, birds possess feathers, extraordinary structures which combine in a most efficient manner lightness and protection from cold and from loss of heat. Peculiar also in powers of flight, in remarkable and varied voices and in the extraordinary variety of their nest building, birds have always been a favorite subject for the nature student. Their variety in any one North American locality is relatively small, in spite of what seems to the beginner a confusingly large number of different kinds of birds. Indeed, only somewhat over seven hundred and fifty different species of birds are known from the whole of North America north of Mexico. It is therefore possible for any earnest student of nature to secure, within only a period of a few months of study, a clear working knowledge of the commoner bird species of his region. No other subject in nature study is provided with so rich and helpful a store of popular literature, making easy, indeed, the path of the tyro.

Louisiana, because of its geographical position, has an especially rich avi-fauna. The history of Louisiana, too, bears in it the name of the greatest ornithologist that North America has ever produced, John James Audubon. If the writer remembers that within the State of Louisiana there are dedicated as wild life refuges and bird sanctuaries, areas which aggregate in excess of one-half of the total area of the sovereign state of Rhode Island, it will be seen that Louisiana has well realized the responsibilities her rich bird life brings.

It may be of interest to the reader to know that one of our most striking species of North American Geese, the Blue Goose, *Chen caerulescens* (Linnaeus), chooses almost exclusively Louisiana as its winter home. Nesting in Baffin Land and Southampton Island, the great companies of Blue Geese swing in autumn southward in the Mississippi Valley, and occupy their winter stations on the Louisiana coast from the mouth of the Mississippi River westward to Vermilion Bay. Only in scattering numbers are they found in winter time in Florida and in Texas. Abundant also are the other species of water fowl, which find winter haven in our State.

It must not be thought that Louisiana winter bird life is any more spectacular than the summer birds of our State, for on the low shell islands that border our coasts, particularly on that slender chain of islands of which the Chandeleurs are part, there gather, in almost incredible numbers, Terns and Pelicans to lay their eggs and rear their young. A visit to these bird cities is an experience that will far surpass, in thrilling interest, any expectations of the bird lover. These islands, so abundantly inhabited by birds, are fortunately sanctuaries, so that unharmed by man, their vast numbers may congregate each year.

There is in the study of birds one ineffable quality which may perhaps be suggested by stating that to the lover of birds, every woodland and every field bring familiar and welcome voices. It is a charming experience to the bird student, when in some remote and unknown part of the continent he first goes afield and hears, as if old neighbors were speaking, the songs of the birds he knew at home. Years of familiarity strengthen rather than dull this pleasure. Yet this pleasure is but one of the many rewards that study of these attractive elements of our wild life brings.

Know your bird neighbors and you will add to the happiness of your life.

POISONOUS SNAKES AND THEIR DANGERS

THE recent and tragic death of a Louisiana farmer within a period of only fifteen minutes after he had been struck by a poisonous snake makes particularly timely the article on "Poisonous Snakes of Louisiana" which appears elsewhere in this issue. Snakes, and other reptiles as well, have always been curious and even fascinating objects to the student of nature. The fact that six species of snakes which occur in Louisiana are capable of inflicting dangerous injury, together with the fact that today, more than ever, the out-of-doors has become a theatre of general recreation, make most desirable an accurate knowledge of what species of Louisiana snakes are poisonous and of what to do in case of snake-bite. The anxiety and often hysterical fear that the bite of a poisonous snake induces, complicate the alarm of such an emergency. The character of the damage done to a human being by snake-bite is such that speed of treatment becomes of paramount importance. There is no time to wait and consult medical treatises. The action of the poison can be largely prevented, if the victim or any one near him already possesses the knowledge of what to do and intelligently and cooly does it. Conservation means not merely the conservation of wild life and of natural resources, but the conservation of human life as well, and it is for this reason, that there is provided this discussion of the poisonous snakes of the South, and the correct treatment of injuries inflicted by them.

Poisonous Snakes of Louisiana

By
JAMES NELSON GOWANLOCH
Chief Biologist
Louisiana Department of Conservation

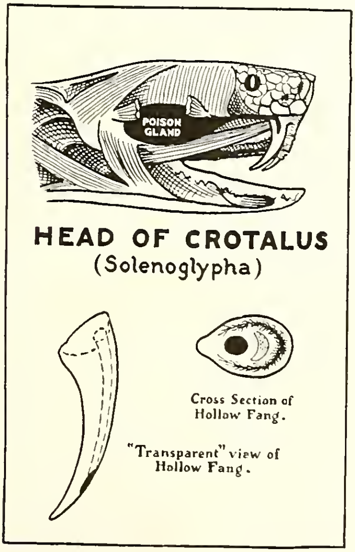
POISONOUS snakes fascinate almost everybody who is interested in animal life, and concerning the subject of snakes in general, and poisonous snakes in particular, there probably exists a greater volume of misinformation and erroneous tradition than about any other natural history subject. Yet, snakes, and the correct treatment of snake-bite, are matters of importance, sometimes of tragic importance, to everyone who spends any time in the out of doors where poisonous species occur.

The present article is designed to give a compact summary of much that is at present known concerning the poisonous snakes that occur in Louisiana and certain additional species that are popularly regarded as dangerous, together with statements of the best methods of treating poisonous snake-bite.

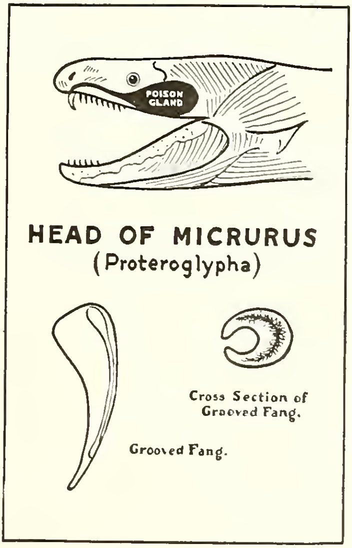
Snakes constitute a real hazard. Fortunately, the poisonous snakes of Louisiana, although numerous, are greatly less dangerous than many poisonous snakes that occur elsewhere in the world. Anyone, however, who has experienced the bite of a poisonous snake will know the pain, the anxiety and the very real danger involved.

Snakes are quite traditionally hated by most people, but as a matter of fact, the great majority of our Louisiana snakes, far from being harmful are really useful animals and, far from being ugly, are both graceful and truly beautiful in their patterns, their colors and their construction. Many species of snakes, some forty odd altogether, occur in Louisiana, and of all these only six species are poisonous. Each will be subsequently discussed and described.

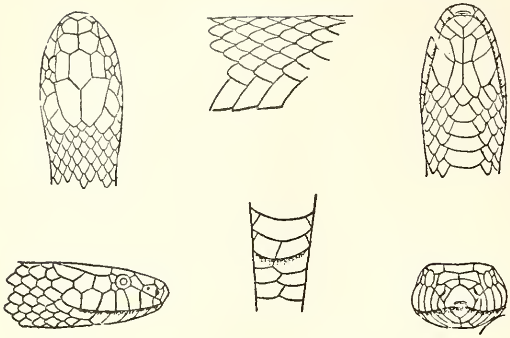
The poisonous snakes of North America belong to two quite different groups. The first, the Elapine snakes are related to the cobras and are dangerously poisonous. The startlingly beautiful Harlequin Snake (incorrectly called the Coral Snake in Louisiana) belongs to this group. To the second group, the Crotaline snakes, belong all of our poisonous species with the single exception of the Harlequin Snake. Here belong all the Rattlesnakes, the Cotton Mouth and the Copperhead. Crotaline Snakes possess three conspicuous characteristics: first, the head is broad and more or less lance-shaped; second, the pupil in-


POISON GLAND
HEAD OF CROTALUS
(Solenoglypha)
Cross Section of Hollow Fang.
"Transparent" view of Hollow Fang.

(After do Amaral)
Diagram showing the arrangement of the poison fangs and poison glands of a Rattlesnake.



(After do Amaral)
Diagram showing the arrangement of the poison fangs and poison glands of the Harlequin Snake (Commonly called in Louisiana the Coral Snake.)



(After Cope)
The Harlequin Snake, *Micrurus fulvius* (Linnaeus). Stejneger & Barbour. (The Harlequin Snake is commonly, though incorrectly, known in Louisiana as the Coral Snake.)
This and the following five illustrations show the details of scale arrangement of the six species of Louisiana poisonous snakes.

stead of being round as in other snakes, is a vertical slit, resembling the pupil of a cat's eye; third, there exists about midway between the nostril and the eye, a peculiar pit, which gives to the whole group their name of "pit vipers". The function of this pit remains still unknown. All of our Louisiana poisonous snakes, with the exception of the Harlequin snake, the Cotton Mouth and the Copperhead, are marked by possessing peculiar structures termed rattles which are epidermal in origin. The form and significance of these rattles will be discussed presently.

[1] All poisonous snakes, not only in Louisiana but everywhere in the world, inject their venom by means of their teeth. Popular tradition to the contrary, no poisonous snake exists that "stings" with its tail. The method of injecting the poison differs quite completely in the elapine and crotaline groups. The elapine snakes do not strike with long fangs as do the Rattlesnakes, the Cotton Mouth and the Copperhead, but instead they "chew". Their venom, however, is extremely poisonous, and furthermore, as will be discussed, crotaline anti-venin, the antidote for Rattlesnake, Cotton Mouth and Copperhead bites is useless for the bite of the Harlequin or Coral Snake. Snakes differ widely, both among species and among individuals of the same species, in their temperament, thus the Coral Snake has the reputation of being typically unaggressive, while certain rattlers scarcely await provocation before they take the offensive.

All Crotaline Snakes (with the single exception of a South American species, the Bushmaster) bear their young alive. The eggs, retained in the oviducts, undergo development there until they hatch. The Harlequin snake on the other hand lays its four to seven eggs under the shelter of a log. They hatch in the extraordinarily long period of thirteen weeks.

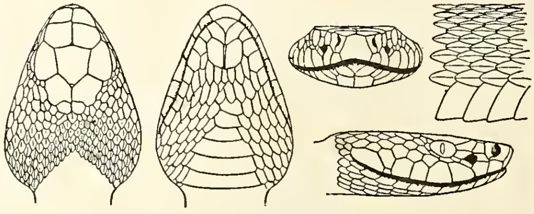
Certain snakes, both real and imaginary, have, in the course of time, aroused a great volume of popular and sometimes completely false traditions. Examples of these are the harmless "stinging snake," common in Louisiana, which arouses intense fear in most people and the "hoop snake" which really does not exist at all.

Snakes are one of the most peculiar groups of vertebrates, and from man's earliest attention to living things about him, they have aroused his curiosity. Feared almost universally, snakes include few really harmful species, but it so happens that among such species are the poisonous snakes, some of which are capable of inflicting not only serious human injury but even death.

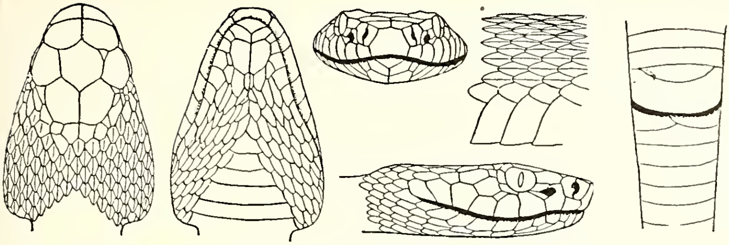
Probably no other field of our knowledge of living things is more full of popular misrepresentations than is the study of snakes. The purpose of this article is, therefore, to present, in understandable terms, information which it is believed will answer with reasonable accuracy, some of the questions asked about snakes by that mythical person "the man on the street."

PLACE OF SNAKES IN NATURE

Snakes are reptiles, belonging to that group of vertebrates, the reptilia, which includes in Louisiana lizards, snakes (serpents), turtles and alligators. Snakes differ from other reptiles (with exceptions which will be stated) in the fact that they have no legs. This does not mean, however, that never in their family tree were they walking animals, for it has been clearly shown that certain of the larger snakes, for example the Pythons, exhibit minute remains of what were once legs. Certain lizards, for example the famous "glass snake", *Ophisaurus ventralis* (Linnaeus) Daudin, have also lost their legs and thus superficially resemble snakes. Such legless lizards differ greatly from snakes in the character of



(After Cope)
The Copperhead, *Agkistrodon mokasen* Beauvois.



(After Cope)
The Water Moccasin or Cotton Mouth. *Agkistrodon piscivorus* (Lacepede) Cope.

their scales and in the form of their bodies. Snakes never possess either movable eyelids or an external opening to the ear (the external auditory meatus). These two points also distinguish the so-called "glass snake" from true snakes, since "glass snakes" possess both of these above named structures. The reptiles possess, on the whole, so many structural features, suggestive of the structural features of birds, that many scientists have treated birds and reptiles as a single group, the Sauropsida.

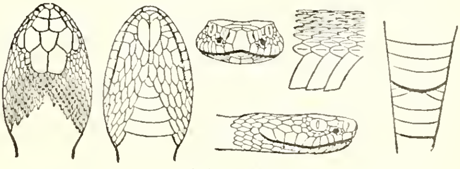
Snakes are also conspicuously characterised by having their bodies covered with scales which are over-lapping or, as the scientist terms it, imbricated. The mouths of snakes are highly peculiar in that the bones of both jaws are remarkably movable, and, being connected only by ligaments, they permit of such an expansion of swallowing space that, actually dislocating its jaws, a snake can engulf prey much larger than its own normal diameter. Although no trace of the original forelegs of snakes appears, some foreign species, as stated above, indicate vestiges of the hindlegs and their accompanying girdles, as for example, the Pythons. The tongue of snakes is a most highly peculiar structure concerning which more will be stated below. Capable of an astonishing protrusion, it has earned the completely erroneous name of "stinger". As a matter of fact no snake's tongue is capable of stinging anything, since never is it provided with poison. The tongue, extraordinarily delicate, is a most sensitive organ of touch. Because of the fact that an alarmed snake displays its tongue in what is, to human beings, a menacing manner, a false impression that it is an organ of defense has widely arisen.

Many different species of snakes, probably somewhat over forty odd, occur in Louisiana, but only six species are poisonous. Many indeed, far from being dangerous, are really friends of man, inasmuch as they destroy insects, rats and mice, that would otherwise feed upon crops. However, so deeply ingrained in the consciousness of men is a profound antipathy towards snakes, that the usual and mostly wrong reaction after seeing a snake is to kill it. It is true that besides the poisonous snakes, certain other snakes should be killed. Such are, for example, the familiar water snakes, which undoubtedly destroy considerable quantities of game and food fishes. Most of our species of snakes are either neutral, or are, in the majority of instances, distinctly beneficial, due as stated above, to their habitual destruction of insect and rodent pests.

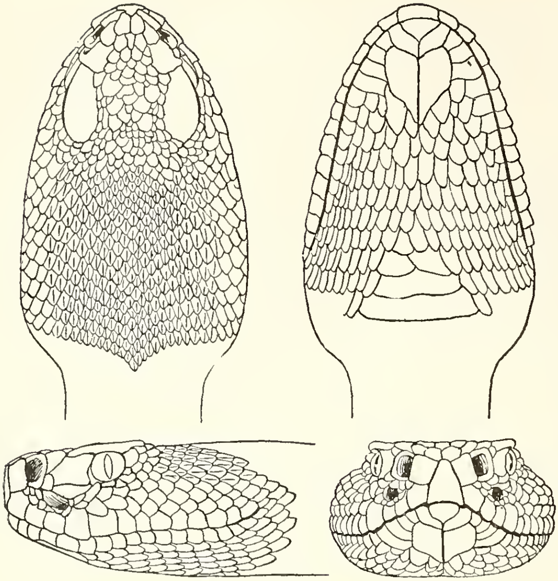
Snakes, in the history of man's thought have played a surprisingly prominent part as symbols of evil, and appear in some of the folk lores of American primitive peoples as powerful deities. Contemporary folk lore, as we shall consider later, includes also a great volume of fantastic legends concerning snakes.

Some Snake Myths

Fishermen, throughout the centuries of their activities, have acquired an amazing reputation for exaggerating their adventures, but the "fish story" must take second place to the "snake story" in point of abandoned deviation from the truth. Every country side can provide people who have witnessed or heard of astonishing adventures with snakes. Let one brief example suffice. There exists in Louisiana a perfectly harmless, docile, and peculiar snake, known almost universally as the Coachwhip Snake, *Coluber flagellum flagellum* Shaw (*Masticophis flagellum flagellum* Shaw), a species addicted to tree climbing and sometimes to nest robbing. The Coachwhip may attain a length of over six feet. Harmless though it is, this snake is seriously believed by many country people to have the habit of actually beating people to death. The setting and character of these alleged attacks upon human beings may become highly dramatic. Thus the writer was seriously informed of the follow-



(After Cope)
The Pigmy Rattler, *Sistrurus miliarius* (Linnaeus) Garman.

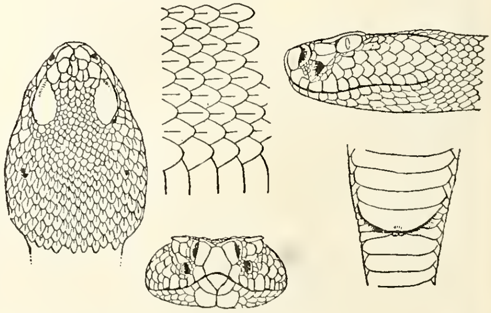


(After Cope)
The Diamond Back Rattlesnake, *Crotalus adamonteus* Beauvois.

ing dreadful tragedy. The cruel brothers of a young Louisiana woman decided to play a practical joke on her, to take advantage of her fear of snakes. Securing and killing a Coachwhip Snake, they placed its body, coiled in a natural position, in her bedroom, and having on some pretense arranged for her to enter the room, they locked the door from outside, and thereafter heard their sister's excited screaming. Time passed and her screams ceased, so, concluding that their joke had gone far enough, they unlocked the door and discovered to their horror, the mate of the Coachwhip Snake had climbed a large magnolia tree whose branches swept the bedroom windows and, entering through the window, had beaten the poor girl to death. The only thing that is the matter with this fine and theatrical story is the simple fact that no Coachwhip could ever beat anyone in any way at all, much less inflict fatal injuries. Another common Louisiana snake that is almost universally feared is the completely harmless, docile and beautiful species known as the Stinging Snake or Thunder Snake, *Farancia abacura* (Holbrook). This creature possesses at the end of its tail a curious horn-like point which it uses to anchor itself on the ground. When picked up the Thunder Snake characteristically presses this structure against its captor's hand, thus gaining for its harmless self a terrible reputation for deadliness.

THE ACTION OF THE POISON FANGS

The construction of a Rattlesnake's fang is peculiar in that it is not as if a tube had been bored through a solid tooth, but is, instead, really a tooth which has become flattened, the edges becoming progressively rolled over until they meet, part of the original external tooth becoming the lining of the tube. This odd history is proven by both the study of the developing stages of the tooth and also by microscopic examination of the structures of the "dentine", the somewhat bone-like substance out of which the tooth is partially constructed. The poison fangs differ also from ordinary teeth in the fact that although securely socketed in the jaw bone (maxillary), they are movable, not because of their ability to move in the socket, but because of the ability of the bone, itself, to move. This movement is accomplished by small muscles (spheno-pterygoid muscles), the contraction of which pushes forward the small, stout, triangular maxillary, which, being caused to rotate, moves the point of the poison fang in the arc of a circle until, instead of pointing backward, the poison fang points downward. Furthermore, this protrusion of a snake's fang is not automatic but is under the control of the snake, the Rattlesnake being able to open its mouth without extending the poison fangs. Further still, the reverse act of swinging the extended fangs back into their usual retracted position is also quite voluntary. This folding back is accomplished by the action of other sets of muscles (the ecto-pterygoid and spheno-palatine muscles). The return of the poison fangs, which may be observed every time after the snake has struck, markedly resembles the shutting of the blade of a pocket knife. The writer has watched Rattlesnakes, after they have



(After Cope)
The Timber Rattler or Canebrake Rattler, *Crotalus horridus* Linnaeus.

fed, repeat this operation of folding the fangs back a number of times in rapid succession. The poison fangs of the Rattlesnake are further protected by a folded membrane which extends over the tooth like a hood, and, when the fangs are erected, slips off the tooth like the finger of a glove and gathers in folds at its base.

The poison gland is the structure in which the venom of the snake is elaborated and stored. In large Rattlers it may be as much as an inch long and contain as much as 15 drops of poison. The ejection of the poison itself may be highly forcible, due to the action of one of the three sets of temporal muscles which are so situated that the swelling of the muscle in contraction presses upon the poison gland. It is not, therefore, necessary that, to eject the poison, the snake must strike any object with its fangs. This is well illustrated by the fact that a snake in a wild strike (missing the object struck at) has been observed to spurt out its poison to a distance of five or six feet. Still a further device, protective in character for the snake itself, has been observed and described by students of snakes. This is that if a Rattler were to miss its strike and close its mouth it would appear inevitable that it would drive its erected poison fangs into the floor of its own mouth cavity. This, however, does not happen because, due to some peculiar arrangement of the bones of the skull, the closing of the mouth swings the points of the poison fangs outward so that these fangs completely clear the lower jaw. The act of striking represents the sum of the whole series of complicated but highly coordinated and swift acts. The snake prepares to strike by throwing its body into more or less a pile of coils, upon the top of which the head, neck and a short portion of the anterior part of the body lie loosely. The projecting tail vibrates its warning. As the enemy approaches, the snake suddenly straightens out these coils at the anterior part of the body, thus flinging the head forward with a speed too fast for the eye to follow. At the same instant the mouth snaps open, the back of the head sets firmly back upon the neck, the fangs, throwing off their sheaths, jerk into the erected position and with the impact of the blow and the entrance of the fangs into the object struck at, the muscles bordering the poison sac contract and a gush of venom is spouted through the tubular teeth. Secondary, incidental, yet important acts occur at the same time. The whole weight of the snake's body drags upon the teeth embedded in the snake's victim, and this action, accompanied by the contracting of the muscles which would ordinarily fold the teeth back into the rest position, results in the deeper penetration of the fangs and a further laceration of the wound. Both results may make possible a more dangerous injection of poison. When all of this chain of complicated events has been rapidly completed the snake disengages its fangs from its victim, an act sometimes difficult if the part struck is small or if the fabric of clothing is present and many of the snake's teeth have become entangled. Once this disengagement is accomplished, the Rattler again throws its body into a pile of coils, raises its head and prepares to strike with lightning speed again at the object. The effective striking distance is less than the total length of the snake, in spite of fantastic popular stories of Rattlers which are able to project themselves bodily through the air.

Any handling of poisonous snakes for the sake of amusement should be strongly discouraged, since if the Rattler or Moccasin is large, their constrictive power is so great that, wrapping their coils around their captor's arms, they may readily succeed in so paralyzing the muscles that, in spite of the obvious danger, the captor is compelled to release helplessly his grip upon the dangerous captive. One method sometimes used in reducing the usual hazards involved in destroying large snakes is to attach a silk handkerchief to the end of a pole and induce the Rattlesnake at bay to strike repeatedly at the fabric. The fangs entangled in the folds of silk can then be torn out, but two things must be remembered: First, that the snake will have, undoubtedly, ejected venom into the handkerchief which, if it comes in contact with open wounds of any kind, will cause possibly dangerous poisoning; and second, it must be remembered that quite probably sufficient venom may be extruded along the jaws of the snake so that, even if the fangless animal should strike, punctures produced by the smaller teeth might cause considerable introduction of poison. Still further, should any such fangless animal be kept subsequently in captivity it must be remembered that Rattlers and other poisonous snakes are able to replace their poisonous fangs rather rapidly.

Effect of Bite of Very Young Snakes

One question frequently asked is the age at which Crotaline snakes become poisonous. The writer, on one occasion, was struck by a single fang of a Water Moccasin, the snake being less than a month old and only about 7 inches long. The fang entered on the distal end of the dorsal surface of the right index finger. It was obvious that only a small quantity of venom could have been injected. The sensation of sharp pain, followed by numbness, rapidly progressed along the finger, through the hand to the wrist, from the wrist to the elbow, and from the elbow to the shoulder, a surprisingly extensive effect for such a small serpent. Treatment, consisting of cutting and irrigating the site of fang entrance, was applied. The effects persisted over a period of some twelve hours. Crotaline snakes, however, have been proven to possess the ability to inflict poisonous bites even when newly born. Stadelman (1928) caused himself to be bitten by a Copperhead, which was only six hours old. The slight pain was followed by an intense burning, and, within an hour and a half, edema involved the entire outer surface of the fore arm, the site of the bite being the belly of the extensor digitorum communis muscle of the left arm. Ten hours later, the swelling had progressively developed, and was still continuing. Seventeen hours later, swelling was still continuing, and so progressed for a total of twenty-one hours after the bite. This time proved to be the turning point in the reaction to the snake venom. Evidences of the reaction of the tissues at the site of the wound were still apparent 18 days after the bite. Stadelman accordingly states: "One may conclude that Copperheads only six hours old are in possession of a complete functional venom apparatus, capable of injecting a dangerous amount of venom, particularly if the victim be very young, or in poor condition."

SNAKE POISON

Snake venom is secreted in the form of a yellowish fluid composed of from fifty to seventy per cent of proteins, the chief other constituent being water. Small quantities of various salts, such as chlorides and phosphates of calcium, magnesium and ammonium occur. The venom is usually acid in reaction, but sometimes neutral. When dried, it will retain for many years its poisonous character, and need only be again dissolved and introduced into the blood stream to produce its effects. Dr. S. Weir Mitchell, the physician who so ably investigated snake venoms over seventy-five years ago, noted that some snake venoms which he retained in a dried condition for twenty-three years, still remained poisonous (Mitchell and Reighert, 1886). The physiological action of various snake venoms is complex, due to differences in the composition of the poisons secreted. Various poisonous elements are the active agents in snake venom. The two most important groups being *neurotoxins,* highly complex protein substances, which have a dangerous effect upon the nervous system and *hemorrhagins,* which possesses the peculiar power of dissolving the walls of blood vessels, particularly the smallest of all blood vessels, the capillaries.

Rattlesnakes and Copperheads characteristically produce relatively little neurotoxin. The Cotton Mouth produces more neurotoxin than either the Rattlesnakes or Copperhead, and accordingly produces a more paralyzing effect.

It was further interestingly found that the amount of poison emitted in a spontaneous bite exceeded (in some instances by as much as 61 per cent) the amount of venom secured by artificially compressing the glands of a snake held in the hand.

SPEED OF DEATH

The time that intervenes between the fatal bite of a poisonous snake and death varies with different species, and also varies with the age and condition of the victim and with the circumstances of the bite. New Orleans newspapers report the death of a 48-year-old farmer, near Rayville, Louisiana, June 25th, 1934, within a period of 15 minutes after being struck by what was believed to be a Rattlesnake. The attending physician expressed the opinion that the snake's fangs must have encountered a blood vessel, and, therefore, the poison was possibly injected directly into the blood stream. Cases of even more immediate death have been recorded. Blackwood states the case of a three-year-old girl, who, bitten on the forehead by a large Rattlesnake, died within ten minutes, while Roberts records the still more deadly episode of a seven-year-old boy, who, on being bitten on the cheek by a Rattlesnake, pitched forward dead before an eye witness could reach him. An analysis of fifty cases of fatal snake bite reveals that eight persons died in less than an hour, thirteen between one and six hours, eighteen in from one to twenty-four hours, four on the second day, four between three and seven days, one at the end of nine days, one at the end of seventeen days, and one over a month after the accident.

Snake bite, through many ages and in many lands, has been treated by many different methods. Today the most effective of all treatments is that of a biologically prepared antidote known as anti-venin. The method involves the deliberate injection of small and repeated doses of the poison of a specific variety of snake into horses, which become thus "immunized" against the poison. The blood of these immunized animals can then be so prepared that the serum can be preserved in glass vials, so arranged that this anti-poison is available for immediate injection into the veins of a victim of snake bite. Because of the differences existing in the poisonous elements of various kinds of snakes such anti-poisons must be relatively specific, that is, they must be prepared by the use of the poison of the kind of snake against whose bite protection is sought.

HYPERSENSITIVITY TO SNAKE VENOM

Remarkable instances of the occurrence of what is known as protein hypersensitivity have been recorded with reference to snake venoms, as reported by Zozaya and Stadelman (1930). So extreme is this sensitivity, that in one instance, a man bitten by a Rattlesnake developed swelling and discoloration of the region of the wound, when he visited the Bronx Zoo and thus came into the presence of Rattlesnakes. A case has been reported, in which, because of his extraordinary sensitivity to snake venom, a physician could not endure having a bottle of the dried venom opened in his presence, since merely being in the same room with the exposed substance induced asthmatic attacks.

Snakes, like other reptiles, are what is popularly known as cold-blooded. This condition (technically described as poiokothermal) does not really mean that the temperature of the animal's body completely matches the temperature of its surroundings, since under certain conditions, the internal temperature may maintain a characteristic, though low, level. Reptiles, lacking the power that mammals and birds possess of maintaining high and efficient body temperatures in the presence of even extreme cold, are accordingly much influenced by this fact in their world distribution. They are characteristically animals of tropical, sub-tropical and temperate regions. Incapable of maintaining their activities in the face of freezing weather, they naturally flourish more successfully where such climatic limitations are absent. Like other "cold-blooded" animals, snakes can survive for a long time without food. Thus Dr. M. Graham Netting describes an instance in which a Timber Rattler, one of our dangerous Louisiana species, lived over two years without partaking of a single bit of food (Netting, 1932).

Several general matters relating to snakes may be here rapidly discussed. Rattlesnakes, in spite of much sentimental "wild west" writing to the contrary, are not gentlemen. They are sinister and treacherous creatures, and the idea, attractive to so many amateur naturalists, of keeping them as pets for observation, is gravely foolish. Even the most experienced professional students of snakes, in spite of years of experience in handling these creatures and great familiarity with their ways, have been bitten, and in some instances fatally bitten by the object of their studies.

SNAKE'S TAIL AND SUNSET

Certain other aspects of snake venom, and the striking of snakes are of high popular interest. Like many other reptiles, snakes retain, to a high degree, some measure of reactivity following death, and thus give rise to the theory, familiar to every child, that a dead snake will wag its tail until the sun goes down. The snake's tail and the sunset have nothing to do with each other, the phenomenon of this movement being merely an evidence of the relatively high degree of independent survival of body tissues after the death of the individual, which survival is especially notable in reptiles. More dramatic and dangerous is the fact that even a dead snake has been known to strike successfully the hand of the man picking it up. The stimulus received by the snake when it is picked up by the tail, may suffice to set in action the machine which, though dead as an individual, still retains the ability to accomplish a swift reflex action. As Dr. Netting has suggested, if you consider that your nerves are strong enough, chop off the head of a poisonous snake, then pinch its tail and watch, with whatever calmness you can muster, the accuracy with which the bloody and headless stump will strike your hand. A question often asked is "are snakes themselves poisoned by snake venom?" The answer is that poisonous snakes are immune to the venom of their own species. This seems to be true, in spite of the slight evidence that has been advanced to the contrary. It is also true, however, that different kinds of poison snakes may be to varying degrees susceptible to the poison of other species. Still further, the poisonous snakes many possess far different types of poison, as for example, a Harlequin, or a Coral Snake, on the one hand and a Rattlesnake on the other hand and these poisons then become effective if introduced by, for example, the Harlequin Snake into the Rattler.

Popularly there exists the idea that the snake venom is for protection only. This is not true, as any, even amateur, student of snakes well knows, since it can be easily observed that the snake uses its venom as a surprisingly effective instrument in the capture of its food. It is obvious that it is easier and lazier for a Rattler to strike a rat that is running past it, and thereafter eat that rat, if, as a result of the strike, the rat, within a period of minutes or even seconds, falls over and dies. And this is precisely what happens. The writer has observed, and always with the keenest interest, the quick flick of the

Rattler's head when rats or mice, introduced into the snake's cage, rush in a terrified manner past the snake. With a motion, too swift for the eye to follow, the snake strikes, the rodent runs a short distance, begins rapid and unsteady circling movements, falls over, twitches momentarily and dies. The snake during all this time, has watched intently with its lidless stare, and characteristically the moment that the motions of its victim have ceased, it glides up, with all its sinister grace of movement, and immediately begins to swallow its prey. The possession of this power of inflicting a chemical death has spared the snake the task of chasing its food. Venom does, of course, constitute a high instrument of protection as well, but the use of the venom and the poison apparatus in food taking is popularly overlooked.

THE RATTLES OF RATTLESNAKES

The rattles of Rattlesnakes are structures unique in the animal world. Many snakes, even the harmless species such as the Hog-nosed Snake (called popularly the Spreading Adder or Puff Adder) possess the habit of rapidly vibrating their tails when excited. If the snake happens to lie coiled among dried leaves, the resulting sound may closely resemble that of a rattle. Snakes shed their skins at varying intervals and the formation of the rattlesnake's rattle is simply the result of the fact that, in each successive molting, a peculiar interlocking button is formed and remains on the snake's tail. The popular idea that the number of "buttons" in a rattle indicates the snake's age, is completely wrong. It is simply another example of a very general and very good idea, one of those many good ideas with which the only trouble is that they are not true. The shedding of the snake's skin depends upon many variable factors, amount of food, rate of growth, temperature, etc. Furthermore, the wear and tear to which the snake's activities expose the rattle, cause the abrasion and breaking off of variable numbers of the buttons. The number of buttons, thus, if all were retained, would be simply the record of the number of times the snake has molted, and this might well have no constant relation with age. When, further, the buttons may be destroyed by wear or by accident, the number of rattles present comes to mean exactly nothing. There is a popular idea, that a rattler cannot rattle while its rattle is wet. The writer has experimentally and readily disproved this many times, by the simple operation of turning water on a caged and angry four and one-half foot Timber Rattler. Wetting the rattles changed the sound, producing a slightly muffled rattle, still, however, clearly audible. Indeed, it seemed doubtful that the audible range was measurably decreased.

There is another popular idea that other animals instinctively fear the sound of a Rattler's rattle. This also is not true, since repeatedly the writer has brought dogs that had had no previous experience with Rattlesnakes up to cages of Rattlers, and the only response such dogs exhibited was one of alert curiosity, a curiosity that, if the dogs had not been restrained, would have immediately brought them within striking range of the snakes.

Another popular faith, generally held by cowboys, is that a rope wound of horse-hair and spread in a circle will prevent a Rattler from crossing it, and that such a hair rope, if used to encircle a tent, will afford adequate protection. This idea, again, is completely false since experimenting with snakes shows that the Rattler is not in the slightest deterred by this device. Another more fantastic tale, found in many folk lores, is that a Rattlesnake will sometimes commit suicide by stinging himself. Thus for example, when a Road Runner, an enemy of snakes, desires to kill the snake, he simply proceeds to build a circle of thorny bushes around the Rattlesnake until the snake, in despair, strikes and kills himself. The only thing that is the matter with this interesting observation, is that the Road Runner never does build such a fence in the first place, and in the second place, if the Rattler did bite himself, his own poison would do him no harm.

The idea that a poisonous snake can spring at a human being is quite false. Elsewhere there is provided a description of the mechanics of a snake's strike. It may be stated that, in general, the effective range of a striking snake is not over three-quarters of the snake's length. A circle whose radius is the length of the snake concerned will cover the danger zone. The first reaction of most snakes, when disturbed, is to retreat. An exception, however, exists when the snake is molting, and, being then blinded by the opaque skin, its irritability is so increased that it will often strike viciously. Our own Cotton Mouth, however, is decidedly vicious, and the writer has repeatedly observed them in Louisiana, when, far from withdrawing, although a retreat was available, they would hold their ground, and, on nearer approach, would lash out venomously.

ENEMIES OF POISONOUS SNAKES

The enemies of poisonous snakes are various. Eagles, large hawks and owls are known to feed upon them. Domestic animals also destroy snakes, especially is this true of hogs, whose immunity to the bite of even large Rattlers is probably due to the fact that the venom injected through the heavy skin into the subjacent layer of fat is, because of the reduced vascular circulation in such a layer, delivered in very minute quantities at a time so that the hog can build up an immunity to the snake poison. The well-known King Snake is a cannibal, and includes among other snakes, poisonous species. Observations show that the King Snake, itself not poisonous, is quite immune to the effects of Rattler venom, and, therefore, with its clever strategy can capture and crush to death a Rattlesnake without itself being harmed.

EFFECT OF SUNLIGHT ON SNAKES

Contrary to popular belief, Rattlesnakes and other serpents, even those normally living in arid areas, are sensitive to sunlight, even to the extent of being fatally injured by relatively brief exposures to full sunlight. Recent experiments on two western species of Rattlesnakes (the Desert Diamond-back, *Crotalus atrox,* and Sidewinder, *C. cerastes*) show that exposure of these snakes to full desert sunlight caused their death within from seven to ten minutes. The cause of death appeared to be due to the elevation of the internal temperatures of the snakes. Apparently the bodies of these snakes could not endure a temperature of over 46° C., (approximately 115° F.)

Although individual snakes of the same species may differ in behavior, and further, the same individual may have a widely variable irritability at different times, nevertheless, certain generalizations concerning our different species of poisonous snakes are reasonably sound. The Harlequin Snake and its more western relative, the Coral Snake, are both typically rather quiet species, secretive in habits and rarely biting unless deliberately provoked by someone who is unaware of their deadly character. The Copperhead and the Water Moccasin (Cotton Mouth), neither of which give any warning, are both vicious in nature. The writer has tamed Copperheads in captivity until they were quite tractable, but when encountered in the field, a Copperhead will usually start striking in any direction. The Cotton Mouth is also typically vicious, and will take the offensive on the slightest provocation. The Rattlesnakes differ considerably in irritability. The Diamond Back is regarded by special students of these serpents as being one of the excitable and most vicious of all North American reptiles. The Pigmy and Timber Rattlers are believed by Ditmars to have become somewhat modified through long contact with man, so that they characteristically seek to escape when disturbed. They are both, however, highly nervous species and if accidentally touched their most probable action is a swift strike.

Poisonous snakes should not be played with. Although it affords a thrill to the amateur naturalist to feel that he has in his possession and under his observation some of these potentially dangerous creatures, the risks associated with the captivity and handling of these animals must be fully realized, since the mere presence of these serpents near human beings often incurs serious dangers. Snakes are exceptionally able to escape from what a hasty inspection might pronounce to be an escape-proof cage. Especially wherever children are around, no poisonous snake should be held captive unless it is kept in specially constructed plate glass fronted cages, the glass further protected with appropriate sturdy wire netting and all doors properly hinged and securely padlocked. Even then, unless some serious use is being made of these animals for study purposes, the retaining of them in captivity involves so much danger that it is a foolish proceeding.

POISONOUS LOUISIANA SPECIES

Lastly, to survey the poisonous snakes of Louisiana it may be said that they include the following:

The Harlequin Snake (commonly called in Louisiana the Coral Snake) belongs, in its type of venom, to the Cobras, those deadly snakes of Asia and Africa, while the Pit Vipers belong to an entirely different group.

The Harlequin Snake (incorrectly termed the Coral Snake), belonging to the family Elapidae. This is a small slender creature, brilliant in color, its pattern consisting of alternate and circling rings of black, red and yellow. Nocturnal and secretive in habits, it is usually observed only by accident. Often described as docile in behavior, it is nevertheless a deadly snake, whose vivid coloring may attract children to play with it, often with most serious results.

Two other snakes which are completely harmless somewhat resemble the Harlequin Snake, and may be popularly confused with it. These are the Scarlet Snake and the Scarlet King Snake. If the reader remembers that the poisonous species, the Harlequin Snake, has a black nose, he can instantly decide whether the snake is a dangerous one.

The Pit Vipers are the most important poisonous snakes of the United States, including as they do all the Rattlers, the Copperhead and the Water Moccasin. Pit Vipers derive their name from

(Continued on Page 44)

Preliminary Report of Archeological Excavations in Orleans Parish

By

J. RICHARD CZAJKOWSKI, Ph. D.

EDITOR'S NOTE AND SUPERVISOR'S REPORT: *Since the material discovered during the excavations contributes much to our knowledge of the American pre-history of this area, we therefore considered it important that we prepare a preliminary report of the results already accomplished. This report has been compiled by Mr. J. Richard Czajkowski, Archeologist of the project.*

This paper is not a final report of the description, interpretation, and conclusions with respect to the materials obtained. We wish to state that we are unable to interpret some of our observations and materials at the present time. As the summary of this report may suggest, there are indications that the material recovered from this site may eventually reveal a phase of ancient life in Louisiana, different from that believed to have existed in other sections of the State. From time to time, depending on the extent to which this survey is carried, we plan to make supplementary reports and a final report with photographs of the materials discovered, whenever it becomes necessary to discontinue the project.

The survey has been made possible through the Civil Works Administration of Louisiana (CWA Service Project 36 L 75 S). The project is sponsored by the Louisiana Department of Conservation.

For the initiation of this project we are indebted to Mr. Maurice K. Weil who suggested and interested Miss Eleanor D. Myers, Director, Orleans Parish Emergency Relief Administration and Mr. James P. Guillot, Secretary, Department of Conservation. Mr. Weil, acting in the capacity of Archeologist, began excavations on January 17th, 1934, and on February 15th, Mr. J. Richard Czajkowski was appointed Archeologist and the excavations were continued under his supervision. The discoveries and accomplishments of this survey are due largely to the keen interest and untiring efforts of Mr. Czajkowski.

Fred B. Kniffen, Professor of Anthropology and Geography, Louisiana State University, visited the locality on the three different occasions, rendering able assistance in an advisory capacity. This report after being compiled by Mr. Czajkowski was submitted to Professor Kniffen for his approval. Professor Kniffen's assistance in the final preparation of this report has been invaluable. We wish to record our gratitude to Mr. F. B. Grevemberg, Orleans Parish Engineer, and Mr. H. M. Gallagher, State Engineer, Emergency Relief Administration for their cooperation and the assistance in carrying out this program.

CYRIL K. MORESI, *Geologist,*
Department of Conservation, Supervisor of Project 36 L 75 S.

THE area under investigation lies within the boundaries of the City of New Orleans, Orleans Parish, Louisiana, and is located approximately four and one-half miles east of the Industrial Canal and one-half mile south of the south shore line of Lake Pontchartrain (Fig. 1).

For the purpose of giving an accurate description of the distance and direction of areas excavated on the shell ridge, a definite point (the storage house, termed "location") has been located as follows: Latitude 30° 2′ 18″, Longitude 89° 59′ 42″.

This particular location was selected because of the human skeletons, pottery, and implements of possible Indian origin that were discovered when excavations were made some years ago for the erection of the United States Airways' Radio Beam Station.

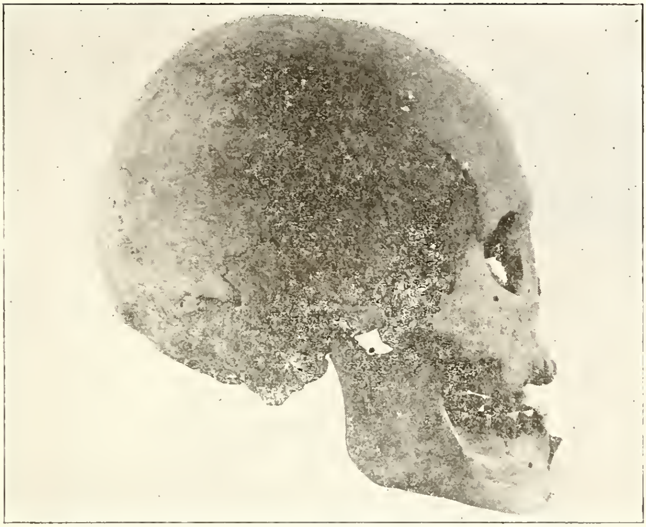
Pottery fragments could be found on the surface when operations were started on January 18th, 1934. Six test pits sunk later in the area where the radio beam was erected did not yield anything of significance.

The surface material of the area under investigation is of very recent alluvial character. Until some fifty or sixty years ago, the area was covered with cypress trees; numerous immense stumps of this species can still be found. Drainage operations started some thirty years ago and transformed inaccessible swamps into fertile fields.

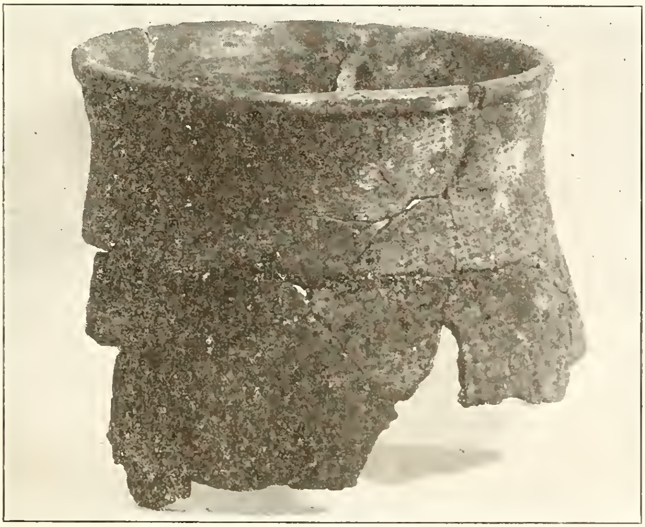
The most prominent topographic feature of the area is a shell reef extending for at least eight miles in a general east-west direction, with numerous short ridges branching outward on the south slope at acute angles in a southeast direction. On the south slope of one of these branches, at a point termed in this paper as Eastern Extension, a burial ground was found with some skeletal remains and much pottery.

After provision had been made for storage of tools and specimens, test pits were sunk in the area, promising looking eminences were staked off, base trenches were dug from which the mound or hill was gradually sliced off and, so to speak, turned upside down. Pottery and bones were found lying on the surface of the uppermost part of the shell ridge. This particular area was thought to constitute an artificial mound. Because of this discovery a five foot survey net was thrown over the mound and elevations of each square were accurately determined. The depth and location of each specimen was recorded and defined as to its position, incidentally making possible the necessary reconstruction of every investigated area. Another important source of information concerning the

Fig. 1



Reconstructed Skull No. 14. Notable are prominent cheek bones (zygomae) and extremely heavy jaws.



Reconstructed part of wide mouthed pot from upper horizon. Shape and stamping decoration had been frequently found in Florida.

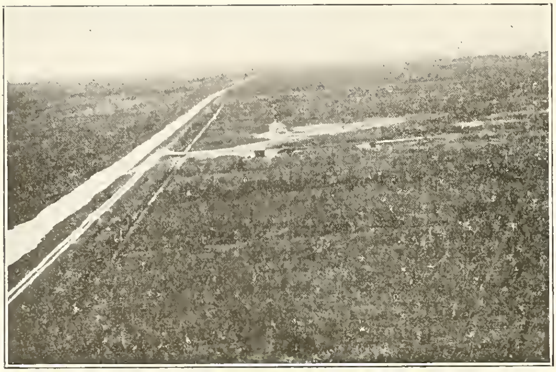


Fig. 2. Photograph showing the general topography of the area under excavation. Shushan Airport can be seen in top right corner.

areas of interest were interviews with local residents, sometimes severely straining one's critical capacities by reason of contradictory statements.

On January 17th, 1934, excavations were begun on the location in the proximity of the Government Radio Station, under the direction of Mr. Maurice K. Weil, Archeologist. During the first three weeks preliminary surveys were made and Mr. Weil located several small mounds. One of them yielded some pottery, stone artifacts and a skeleton, described in his report. On February 15th, Mr. Weil resigned, and on this day I succeeded him and continued conducting the excavations. Due to the fact that we had fifty men well acquainted with the nature of the work, we were able to explore a major portion of the area by means of innumerable test pits and trenches. We gradually became aware of the fact that we were dealing with two definitely different horizons: One, found either on the surface or, at the most, within eighteen inches of fairly recent deposit of soil and represented by crude pottery and few skeletons in very bad state of preservation; the other varying from two to seven feet in depth frequently lying under a natural shell deposit, and vastly different from the first one in quality of pottery and appearance of skeletons. Throughout the whole length of the shell ridge the same conditions seem to be in evidence, that is, all finds are on the south slope of the ridge in a narrow strip, approximately forty feet wide. The sherds did not reveal any indication of having been washed out from the Lake by wave action so the fact of finding them exclusively on the south slope must have some other significance. It is also characteristic that pottery and bones found near the surface are very much scattered, some fragments of the same pot being as much as seventy-five feet apart. Specimens found within and under the deposit of shells remained unscattered, although they were crushed and flattened, the crushed and flattened condition of these specimens possibly resulting from the weight of the overlying sediments. Because of the finds being more or less consistently and evenly distributed along the shell ridge the idea of recording them as coming from separate mounds was abandoned as such accumulation of arbitrary locations would be more of a hindrance than a help, and it would have presented a rather confused picture.

Most of the burials on the shell ridge were solitary and no funereal furniture or artifacts were found with them, with two exceptions: (1) On March 20th, two skeletons were found in a semi-flexed, east-west position. The following day, five more skeletons were uncovered, making a total of seven, all lying in the same position, parallel to each other about four feet apart, at a depth of about five feet. Due to some unfortunate misunderstanding this burial was removed before a thorough record was made. The area was thoroughly sifted and two fine specimens of quartz crystal were found. The skull of one of the skeletons (Fig. 3) was since reconstructed but most of the bones had been commingled, thus ruining probably the most important find on this location; (2) On June 1st, at a depth of six feet a single skull impaled on a tree stump was found. Un-

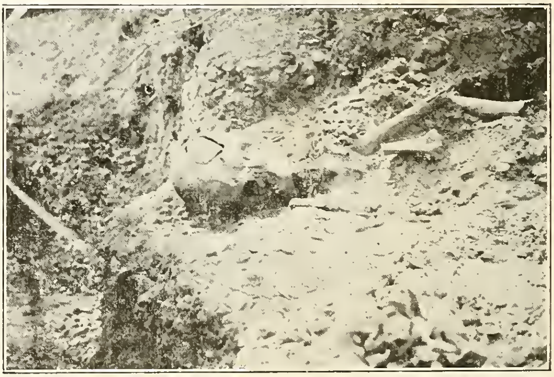


Fig. 3. Skull No. 14 lying in place. This skull was the first to be uncovered from the burial ground and was found in the undisturbed layer of shells.

derneath the skull there was a small fragment of decorated pottery.

The importance of the above stated facts will be discussed in the succeeding paragraphs along with the description of the material. All materials described pertain to excavations within and below the shell deposit.

Description of Materials Recovered

Burial Ground: Seven skeletons found on March 20th, 950 feet northwest from the location. Adults, in fairly good condition; all skulls crushed except one (Fig. 3). Six in semi-flexed position on their backs (Fig. 3). All lying parallel in an east-west position with their heads west. The seventh at full length on its face. They were lying at a depth of about four feet from the surface and overlain with a shell bed from two to twelve inches in thickness. The distances between skeletons were from three to four feet.

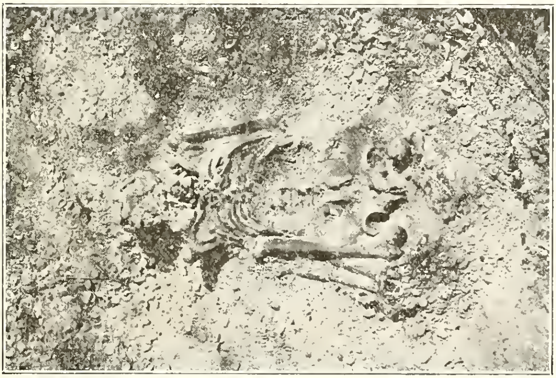


Fig. 4. Skeleton partly uncovered from the burial ground.

Animal Bones: A considerable amount of animal jaw bones was found, in very good state of preservation, but lack of other parts of animal bones makes it possible to assume that they were imported rather than acquired on the location. The jaws are mostly deer, peccary and small rodents; also a large number of deer horns and antlers were uncovered. Peccary has been found in Louisiana within historic times and may still exist within the confines of the state.

Deer horns show signs of being used for working purposes (Fig. 5) but antlers do not show any indications of being used for chipping.

Skulls: Skull No. 14: This skull comes from the burial ground 950 feet northwest of location (Fig. 1):

Very high zygomae
(Zygomatic arches broken on both sides)
Low brain capacity
Teeth well worn
Mastoid process prominent
Body of lower jaw very prominent
Ramus of lower jaw at the obtuse angle
External occipital protuberance slight
Back part of occipital flat
Coronal suture and Stephanion hardly noticeable.

Measurements

Thickness of ramus 13 mm.
Height of lower jaw (perpendicular line through mental foramen to the base of the jaw) 3.5 cm.
Length from the back part of ramus to mental foramen 8.3 cm.
Length from the back part of ramus to the center of mental protuberance 12.2 cm.
Height from the base of lower jaw to the malar canal 8.8 cm.
Distance between malar canals (measured by chord) 11.6 cm.
Distance between temporals (measured by chord) 9.4 cm.
Distance from Lambda to Bregma 14.0 cm.
Distance from Bregma to frontal bone 8.4 cm.
Distance from Bregma to nasal bone 3.6 cm.
Distance from occipital protuberance to Lambda 6.8 sm.
Distance from nasal to mental protuberance 13.3 cm.
(Total from occipital to mental protuberance 46.1 cm.)
Distance between extreme points of the left and right ramus (measured by chord) 13.0 cm.
Distance between extreme points of lower jaws (Measured by chord) 11.8 cm.
Cephalic index .76 mm.

The above craniometric points were obtained by very inadequate means due to the lack of proper instruments and it would be advisable to have the measurements rechecked.

Skull No. 27: Of this skull only frontal bone, bregma, and occipital were reconstructed and the measurements had to be postponed until the time when the reconstruction is completed. Frontal bone seems to be longer than the one described in skull No. 14. Coronal suture very prominent.

Stone Implements: There are thirty-one spear and arrow heads, ranging from three-quarters to three-and-one-half inches in length (Fig. 4). Flaking in first, second and third stage. The projectile points are all of the form and material common to Louisiana.

Pottery: Numerous sherds of both decorated and plain pottery have been discovered. There are forty-eight different patterns appearing on the decorated fragment. It is interesting to note that none of these patterns consist of curved or

(Continued on Page 18)

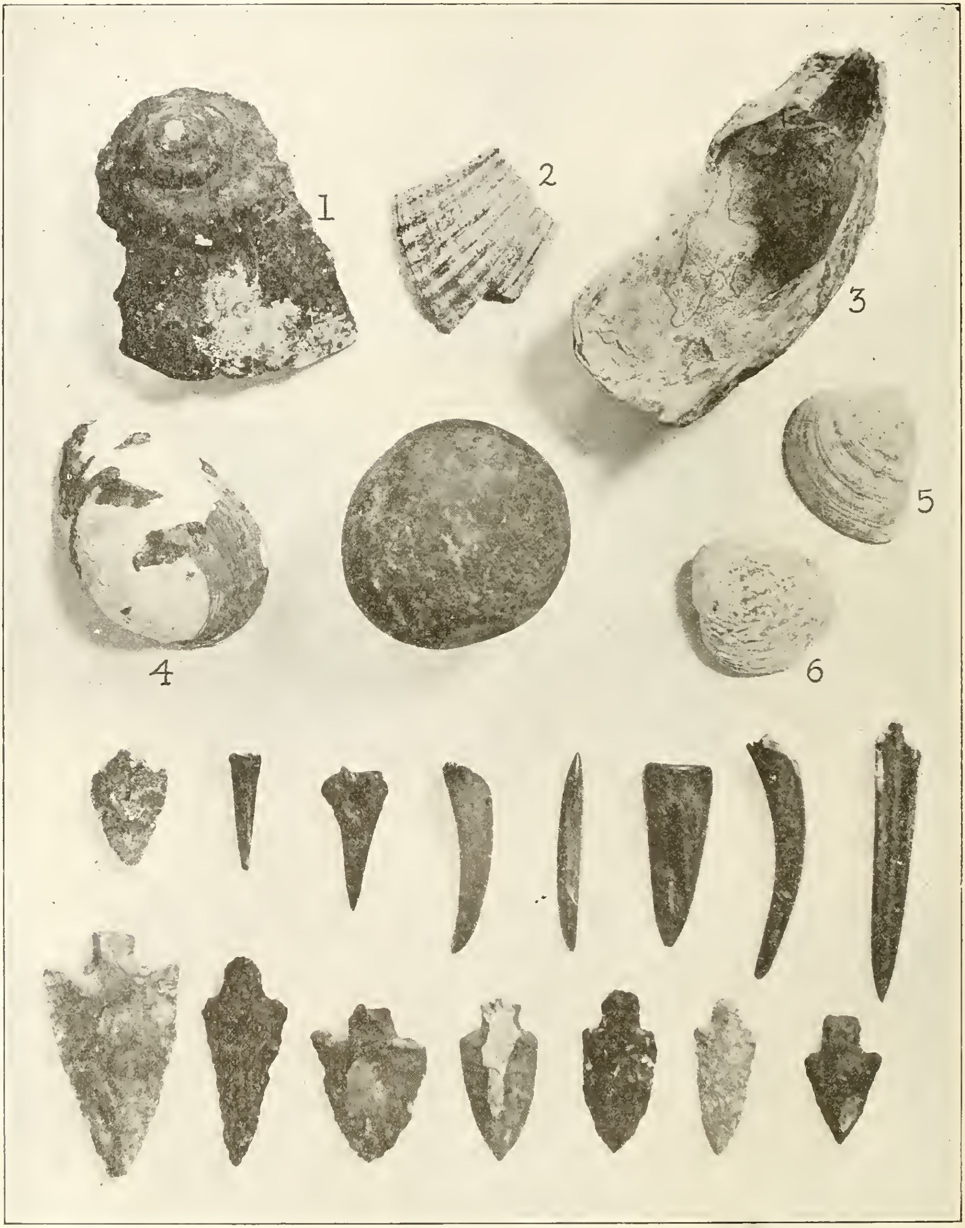


Fig. 5. Projectile points (arrow heads, etc.), shells, bone awls and tusks. 1 (*Fulgur* sp.), 2 (*Cardium* sp.), and 3 (*Otsrea* sp.) are salt water species, while 4 and 6 are fresh-water clams, and 5 (*Rangia cunaeat*) is a brackish water clam. Between 4 and 6 is a hammerstone.

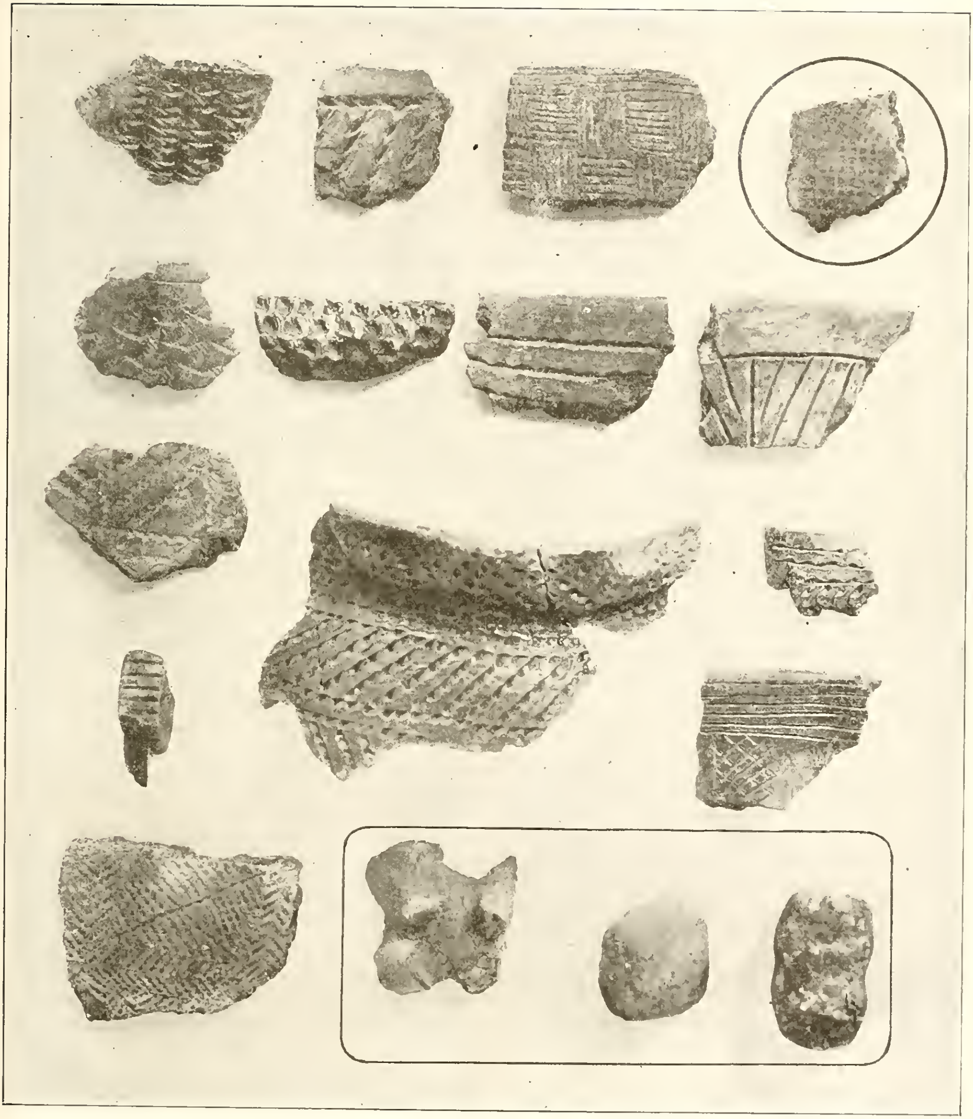


Fig. 6. Pottery and other artifacts of clay. With the exception of the sherd in the upper right-hand corner all the fragments were found in the lower horizon. The sherd is a fragment of partly reconstructed pot (see fig. 1). In the bottom row the last three objects, from left to right, are: an inverted, four-pronged vessel leg; a double cone-shaped object; a compressed cylinder with a small hole running from end to end. The use of the last two objects is problematical.

spiral designs. Some of the incised decorations show a great deal of craftsmanship and fine sense of design (Fig. 6). Clays used for this pottery were not found anywhere in the vicinity of the excavations. Tempering of the clay appears infrequently and no indications of shell tempering have been found.

From the fragmentary remains of the sherds and rims it would appear that in general the pottery is of a broad mouthed, gently curved type. A few flaring rims indicate a departure from this pattern. There is nothing suggesting a bottle; there is one small "paint" pot. Of the techniques involved in the decoration there is a marked absence of stamping (with the exception of one piece Fig. 6) or rouletting. However, in the scalloping and other fine decoration a high degree of artistic skill is indicated.

SHELLS: The entire ridge represents what appears to be a natural accumulation of shells, very largely *Rangia cuneata,* a brackish water clam, extending in geologic range from Pliocene through the Recent. A very few shells of other species were encountered: the oyster and a few other salt water forms, as well as several fresh-water clams (Fig. 4). Today *Rangia* would hardly be considered edible; it is not reasonable to assume that the Indians found in it an important source of food. The few shells other than *Rangia* frequently show evidence of having been used as receptacles or scrapers. In this connection it may again be emphasized that shells were not used as tempering in the making of pottery.

ELEVATIONS: Recent surveys of the Lake Pontchartrain area have determined the Lake level to be approximately four (4) feet above sea level. The top of the shell ridge lies approximately four (4) feet below the level of Lake Pontchartrain. Therefore, the top or uppermost portion of the shell ridge lies approximately at sea-level.

It is important to note that there are two definite horizons from which materials have been recovered. The upper horizon lies approximately at sea-level while the lower horizon, lying beneath an undisturbed and natural layer of shells, is from two (2) to seven (7) feet below sea-level.

Therefore, the discovery of these materials, which were no doubt accumulated during the time when this portion of the shell ridge was either at sea-level or above sea-level, may have an important bearing on the past and present relative positions of the sea and the land.

As soon as the U. S. Coast & Geodetic Survey has available an accurate determination of the level of Lake Pontchartrain with reference to sea-level the above elevations will be rechecked.

SUMMARY

In the present state of the investigation, though much remains to be done in the way of correlation, the following points appear to be well established:

1. There are two definite horizons. The lower lies beneath an undisturbed and natural layer of shells and yields materials definitely different from the upper or surface horizon.
2. Evidence of change of elevation. The lower horizon lies below sea-level.
3. Absence of definite mounds.
4. Absence of European trade articles.
5. Only one kitchen-midden found.
6. Absence of charcoal.
7. Pottery untempered. Fine craftsmanship in decorations of the pottery. Very characteristic absence of circular designs. Wide mouthed pots in majority. Pottery abundant.

DEPARTMENT OF CONSERVATION PUBLISHES GEOLOGICAL BULLETIN NO. 4

Published as the fourth of a series of geological bulletins, designed to present a complete geological study of Louisiana, "Louisiana Sabine Eocene Ostracoda," a study by Dr. Henry V. Howe, Director, School of Geology, Louisiana State University, and Julius B. Garrett, Jr., of Baton Rouge, graduate of the school, has recently been issued.

The series of studies is being published by the State Department of Conservation, the work in each case having been done through the co-operation of the School of Geology and the State Conservation Department. Dr. Howe is the senior author of each of the studies. Cyril K. Moresi, a graduate of the School of Geology, now geologist with the Bureau of Scientific Research and Statistics of the Mineral Section of the Conservation Department, is junior author of the first and third of the series, and William E. Wallace, of Shreveport, is junior author of the second study, entitled "Foraminifera of the Jackson Eocene." Each of the junior authors did the work as an advanced student of the school. The

(Continued on Page 25)

Our Louisiana Wild Life and Sanctuaries— A National Asset

Radio Address by James P. Guillot, Secretary of the Louisiana Department of Conservation, at the request of the New Orleans Young Men's Business Club,—Delivered over WWL on May 15, 1934, at 5:15 p. m.

JAS. P. GUILLOT

As Secretary of the Department of Conservation, permit me, Mr. Treleaven, to thank you and the splendid organization you represent, for the opportunity given the Commissioner and his staff to elucidate subjects in the series of talks over WWL indicative of the department's major activities, and which prove of such vital interest to the state and nation from the standpoint of conservation.

Continuing this series, I am pleased to represent this evening Mr. Armand P. Daspit, able, practical, and experienced director of our fur, wild life, and parks division, who happens to be out of the city. I shall endeavor to prove a worthy substitute with the subject I have chosen.

In truth, wild life and its sanctuaries constitute one of the major factors of Louisiana conservation. Today restoration and rehabilitation of wild life is the national cry, and, therefore, a national duty.

NATIONAL CONSERVATION CONVENTION EPOCH MAKING

It may be worthwhile at this time to recall that a little more than a quarter of a century, to be exact just twenty-six years ago today, there came to a close one of the most memorable conferences held at the National Capitol of these United States, dealing with Conservation of the Nation's Resources.

Theodore Roosevelt, President of Action, of American vision, and progressive patriot, on May 15, 1908, in unison with the governors of the several commonwealths of this republic, under the seal of the highest authority, issued a solemn and formal protest against the economic waste that had prevailed throughout the history of our country,—there and then declared:

> "The Conservation of our natural resources and their proper use constitute the fundamental problem that underlies almost every other problem of our national life."

LOUISIANA CARRIES OUT MANDATE OF MEMORABLE CONFERENCE

These solemn and inspiring words, uttered with a conviction so characteristic of Theodore Roosevelt, before an assembly of the most distinguished and farseeing group of men of that day, electrified the nation, and today stand crystallized in our own state by the establishment of a Department of Conservation, which state agency is daily making such progress in the proper conservation of wild life that Louisiana is now looked upon as the foremost conservation state in the Union.

It is a well settled fact that no other commonwealth is so richly endowed with nature's gifts as Louisiana—no other city in the world enjoys at her threshold such an abundance of natural wealth as does our own most interesting metropolis.

My radio time limit forbids a detailed discussion and enumeration. My remarks will be confined to a brief resume of what has been done and what the department is now doing to make Louisiana wild life and sanctuaries a national asset, or to show our relative position in the present national conservation program.

Louisiana presents, among all the 48 states an unique picture of ornithological complexity, for Louisiana blends a western and an eastern and a North American and a tropical bird life, all in one.

Furthermore, Louisiana lies as a chief port of call in that great flight-way from the Arctic to the Antarctic, the Mississippi Valley. Recent researches, conducted under the supervision of the Department of Conservation, reveal the astonishing fact that no less than 397 different kinds of birds have been found in Louisiana; of these 343 are distinctly different birds and 54 are geographic races, called by scientists, subspecies.

PASSENGER PIGEONS

No other state in the Union can present such a picture of ornithological complexity. This, indeed, is a fit field for the bird lover and here, in times past, the bird lover has come, has searched and has thrilled.

The most distinguished of all names in American ornithology is that of John James Audubon, after whom we have named, in this city, a park and a telephone exchange. May I remind my listeners that John James Audubon spent the most fruitful of his years right here in the Vieux Carre of New Orleans, where he had his studio in which he examined birds then new to the eyes of science, and made those marvelous drawings of them; all this he did within a few blocks of where I speak, for his studio throughout these abundant years of his life was located at 519 St. Ann Street in one of the famous Pontalba buildings.

A copy of Audubon's magnificent masterpiece, displaying hand-colored life-size plates of all American birds then known is on permanent public exhibition in the State Museum at the Cabildo. This great work was published over one hundred years ago at the original subscription price of one thousand dollars a set.

PRESENT NATIONAL ADMINISTRATIVE ACTION

It is gratifying to see at this time that the late illustrious Roosevelt's kinsman, President Franklin Roosevelt, is taking up the task inaugurated by our country's greatest conservationist and naturalist. Indeed, President Franklin Roosevelt, now a leader in conservation, is bringing about the dawn of a new day, especially for wild life restoration.

Late in December, in response to an appeal from the United States Senate Committee on Wild Life, the President agreed to do his best to secure a million dollars for immediate waterfowl restoration work and to assign the Civilian Conservation Corps Camps to conditioning the areas acquired.

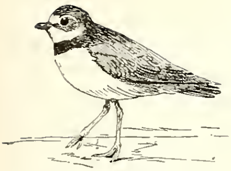
He did, also late in December, announce the allocation of twenty-five million dollars for the purchase of sub-marginal farm lands to remove them from agriculture, and to use such lands for forests, parks, water shed protection, and wild life restoration. The sub-marginal land purchase program of the federal government is moving forward. Mr. Wallace, Secretary of Agriculture, has been urged to do his utmost to make extensive purchases to benefit wild life, particularly waterfowl breeding grounds and refuges along their main lanes of flight, to relieve, as far as possible, the status of these birds, due in large measure to years of encroachment by agriculture.

President Franklin Roosevelt has determined that our work is one of restoration. He has declared that the nation's first asset is to be found in the life of the people, which life is bound up and completely dependent on nature's material wealth, reaching every hamlet in this great republic.

RECENT CONGRESSIONAL ACTION

Under the leadership of President Franklin Roosevelt, and backed by public sentiment, Congress has recently enacted the most far-reaching wild life legislative program ever attempted. Thanks to such conservationists as Senator Harry B. Hawes and Seth Gordon, President of the American Game Association, I cite the following recent federal enactments: Walcott-Kleberg Duck Stamp Law, the Coordination Law, and the Rob-

The thrifty Louisiana Muskrat comfortably at home whose furs are shipped and manufactured over this country and Europe yielding millions of dollars to Louisiana yearly.



WILSON PLOVER

inson Refuge Law. I invite your perusal of a very illuminating pamphlet by Senator Hawes, entitled, "Memorandum on Conservation Progress in 1934," copies of which can be secured at his Washington office, Washington, D. C.

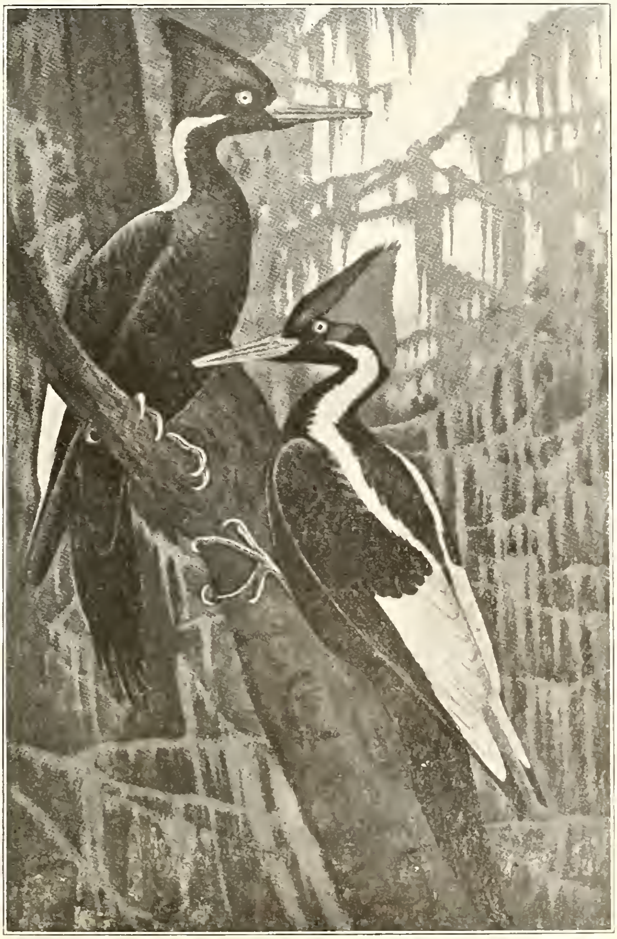
While our Federal Congress has heretofore moved slowly along conservation lines, it has now at last awakened to the necessity of rescuing and salvaging what yet remains of a past abundance. The cooperation of federal and state conservation alone can maintain a "last post" for wild life.

When reviewing the tradition and written page of our country's history, it is not difficult to form an adequate mental picture of the appalling destruction of wild life that has occurred on the continent of North America, due to the hand of man. There may be many reasons assigned for this destruction, among which may be stated the ever-increasing population with a steadily expanding industrial and agricultural development, often found in the very heart of the home of wild life. Here in Louisiana, for example, a region, by grace of geographical position, history, and original habitat of the country's rarest specimens of animal and bird life, we find specific instances of this startling and alarming ebb in wild life resources.

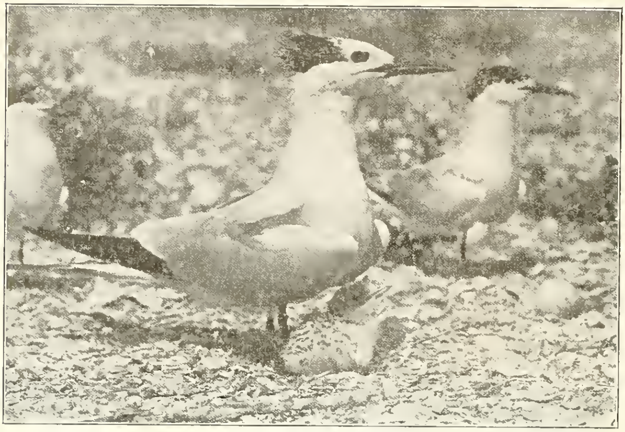
Audubon and Louisiana's Wild Life Heritage

An illuminating fact of this wild life slaughter, especially of migratory bird life, is found in the writings of John James Audubon (1785-1851). Quoting from his monumental work on this same subject:

> "While at New Orleans on the 16th of March, 1821, I was invited by some French gunners to accompany them to the neighborhood of Lake St. John to witness the passage of thousands of these birds, which were coming from the northeast and continuing their course. At the first appearance of the birds early in the morning, the gunners had assembled in parties of from 20 to 50 at different places, where they knew from experience that the plovers would pass. There stationed, at nearly equal distances from each other, they were sitting on the ground. When a flock approached, every individual whistled in imitation of the plover's call note, on which the birds descended, wheeled, and, passing within 40 or 50 yards, ran the gauntlet, as it were. Every gun went off in succession, and with such effect that I several times saw a flock of a hundred or more reduced to a miserable remnant of five or six individuals. The game was brought up after each volley by the dogs, while their masters were charging their pieces anew. This sport was continued all day, and at sun-



THE RARE LOUISIANA IVORY-BILLED WOODPECKER



ROYAL TERN

> set, when I left one of these lines of gunners, they seemed as intent on killing more as they were when I arrived. A man near the place where I was seated had killed 63 dozen. I calculated the number in the field at 200, and supposing each to have shot 20 dozen, *48,000* golden plovers would have fallen that day."

Such is an example of greedy butchery by ruthless pioneers and gunners of that and an earlier day in the fatal flood of gun powder annihilation of the abundance of animal and bird life, many species of which are now standing on the verge of extinction. I refer to the eskimo curlew and passenger pigeon and other rare specimens which we find only in remote regions or a record of them in the written page.

To end this ruthless destruction, Louisiana, some 80 years ago realized her responsibility and accordingly the legislature, in 1857, shortly after Audubon's death, passed Act 100. The provisions of this act may be of interest to you:

> "That any person convicted of shooting wild ducks, snipe, or water hens (poule d'eau) in any of the lakes, lagoons or bayous belonging to the State of Louisiana, and within the limits of the Parish of St. Bernard, before 6 o'clock a. m., or after 2 o'clock p. m., shall pay a fine of not less than $10.00 or more than $20.00 recoverable before any Justice of the Peace, one-half of said fine to go to the informer, and the remainder to the public school fund of the parish."

This was Louisiana's first conservation legislative step. Since then our Pelican state, with her vast area of 48,706 square miles, consisting of 28,000,000 acres, 3,398 square miles of water areas, 4,760 square miles of land-locked bays which furnish feeding grounds and breeding places for innumerable marsh-dwelling furbearers and game water fowls, both migratory and native, has kept up a slow but progressive march in making this region one of unique importance in the conservation pattern of this entire country.

LOUISIANA'S WILD LIFE QUADRANTS—RELATIVE POSITION IN NATIONAL CONSERVATION PROGRAM

If the State of Louisiana be divided into four quadrants to suit its wild life pattern, one northwest and one northeast, one southwest and one southeast, a wonderful ornithological picture results.

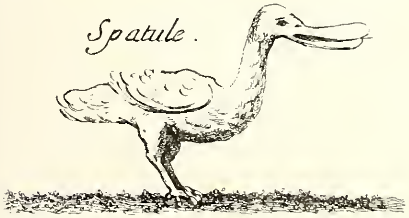
Let us begin as did the pioneers, within the southeastern quadrant, in which lie the parishes or counties of West Feliciana, East Feliciana, St. Helena, Tangipahoa, Washington, St. Tammany, Ascension, Orleans, St. Bernard, Plaquemines, Jefferson, Lafourche, Terrebonne, Iberville, Pointe Coupee, St. Charles, St. John the Baptist, St. James, Assumption, Livingston, East

OPOSSUM, COMMON FOLKS OF THE CHENIER

Baton Rouge, and West Baton Rouge. There lie, in this lowland and upland quadrant or section of the state, game birds of every species, and some of the most spectacular breeding colonies of terns in the entire continent and also habitats of Louisiana's most prolific fur bearers. In this quadrant are a number of state and privately owned marsh and large upland reservations serving as sanctuaries for wild life.

Louisiana Wild Turkey which abounds in the northeastern quadrant of the State.

In passing let me remind you that Louisiana's average output of pelts, according to the records of the department, will average something over 4 million annually over a period of a decade. There are approximately 100,000 people, either directly or indirectly, dependent upon the fur industry of the State of Louisiana for their livelihood. An interesting fact is that Louisiana furs are manufactured not only in the United States, but also in Germany, Belgium, and England. The articles manufactured therefrom are mostly coats, linings, capes, scarfs, trimming, and neck pieces. You readily see that when we include the manufactured products of pelts, employment is given to many thousands and will run into many, many millions of dollars. Thus the Louisiana fur and hide industry alone is of national import.

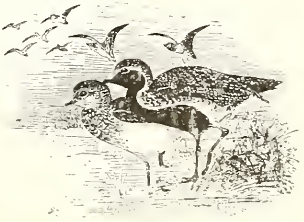


The Roseate Spoonbill, that erratic and spectacular bird, which nests in Cameron parish.

As already stated, the great conservationist and great American, Theodore Roosevelt, set aside at the time of his distinguished contributions to conservation of our North American wild life, certain bird preserves which lie in a chain of islands strung in a slender necklace along southeastern Louisiana in the Gulf of Mexico, and known as the Chandeleur Islands.

Northeastern Louisiana, out of which are carved the parishes or counties of Union, Morehouse, West Carroll, East Carroll, Madison, Catahoula, La Salle, Concordia, Avoyelles, Ouachita, Richland, Caldwell, Franklin, and Tensas, boasts among its ornithological treasures the possibly single surviving colony of North America's largest and most beautiful woodpecker, the Ivory Bill. In this quadrant is one of the largest wild life reservations in the south, consisting of 125,000 acres, known as the Singer and Fisher Bird and Animal Reservation. In this upland state-protected-and-closed preserve are to be found the rarest species of game birds and fur bearers. Therein abounds the wild turkey and the deer.

The northwestern Louisiana quadrant, in which we name the parishes or counties of Caddo, Bossier, Webster, Claiborne, Lincoln, Jackson, Grant, Sabine, Vernon, Rapides, De Soto, Red River, Bienville, Winn, and Natchitoches presents, *an upland ornithologically rich*—a wild life area where

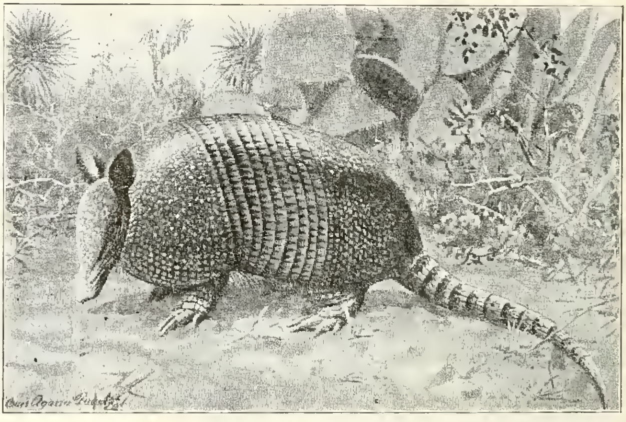

Golden Plover about which Audubon wrote so graphically.

occurs a marvelous mingling, in times of migrational travel, of northern and southern birds—of eastern and western birds. In this quadrant this state has established two extensive game and fish preserves, one known as the Northwest Game and Fish Preserve, and the other known as the Lake Bistineau Game and Fish Preserve. These two preserves cover an area of 50,000 acres.

The southwestern Louisiana quadrant, in which are found the parishes or counties of Beauregard, Allen, Evangeline, Acadia, Calcasieu, St. Martin, Iberia, St. Mary, Cameron, Jefferson Davis, Vermilion, Lafayette, and St. Landry is a land incomparable to any other in these United States. It is a land unto itself. There one can see all of the picturesque pageant of the round-up and there, at other seasons, the cow punchers ride the herd.

SCISSORS-TAIL FLYCATCHER

It is probable that not one out of ten thousand of my listeners knows that Louisiana includes, in the roster of its wild life, that strange, shy, primitive, mammal, the armadillo, yet southwestern Louisiana is typical armadillo country, where the armadillo is abundantly found. Southwestern Louisiana, too, is a marvelous ornithological land, for there are found the scissor-tail flycatcher, a bird that no nature student, once beholding, will ever forget; and there, too, occurs, as a breeding species, one of the most exotic of all North American birds, the Roseate Spoonbill. Erratic and spectacular, it nests in Cameron parish on those strange islands that one year are islands and the very next year are merely part of vast prairie expanse of dry land.



That strange, shy, primitive, mammal, the armadillo, abundantly found in southwestern Louisiana, which is typical armadillo country.

In this quadrant are Louisiana's world famous bird sanctuaries, the Rockefeller Foundation, the Russell Sage or Marsh Island Foundation, the State Wild Life Refuge, the Audubon Society Reservation, and the McIlhenny-Ward Bird Reservation. All of these harbour some 85% of the blue goose and other migratory game birds of North America throughout the winter. According to Mr. Alfred M. Bailey, of the Chicago Academy of Science, "the blue geese have the distinction of being the only migrating birds in North America which have successfully held their own," and he makes it clear that only the protection which Louisiana game sanctuaries afford has made this possible.

CONCLUSION

With the state and nation now arm in arm, working enthusiastically together under the new deal conservation program, may it never be again charged that:

> "Every countryside proclaims the fact that we have today less control in the field of conservation than in any other contact with surrounding nature.
>
> "We patrol the air and the ether, but we do not keep filth out of our creeks and rivers. We stand guard over works of art, but species representing the work of eons are stolen from under our very noses. We stamp out the diseases of crops and livestock, but we do not know what ails the grouse, or the ducks, or the antelope. In a certain sense we are learn-

Millions of Ducks and Geese wintering on Louisiana's Wild Life Sanctuaries

ing more rapidly about the fires that burn in the spiral nebulae than those that burn in our forests. We aspire to build a mechanical cow before we know how to build a fishway, or control a flood, or handle a woodlot so that it will produce a covey of game."

Let us rather be armed with the sincere conviction that the controlling force of true conservation comes only through co-ordination of science, experience, and education! I thank you.

BULLETIN NO. 4

(Continued from Page 18)

first and third studies are "Geology of Iberia Parish" and "Geology of Lafayette and St. Martin Parishes."

IMPORTANCE OF STUDIES

The significance of the series is apparent when it is known that the early geological studies made of Louisiana through the co-operation of the university and the state formed the basis for much of the oil development which later drew world attention to Louisiana, it is stated.

In the introduction to the study, Dr .Howe states that "The purpose of this paper is to describe, as nearly as conditions permit, a representative microfauna from the Sabine group of northwest Louisiana. In the beginning, it may be said that this group of formations, which mantles the surface over most of the Sabine Uplift, has been the least studied from a micropaleontologic standpoint of any of the Tertiary formations of Louisiana." He says further in this foreword that "it is hoped that the Ostracode faunes described in this paper will prove an aid to future workers and assist them to unravel the great sequence of beds now known to belong to the Sabine group on the south flank of the Sabine Uplift."

The localities from which the ostracodes described in the study were obtained are listed as Sabinetown and Pendleton, Tex., and Marthaville and Fort Jessup, La.

Four full-page plates give attractive illustrations of various types of specimens described, and an eight-page bibliography makes the work particularly valuable for the student. A map of Louisiana showing the area in which geological surveys have been conducted by the State Department of Conservation in co-operation with the University makes an attractive illustration for the back cover.

South Louisiana Produces 60 Per Cent More Oil Than Northern Section of State

New Orleans Becomes Capital of Great Petroleum Area With Millions Invested in Industry

By
THOMAS EWING DABNEY

NEW ORLEANS is in the largest oil-producing territory in Louisiana—its logical capital. The present output is great, and geophysical explorations indicate that it will be greater.

Not many New Orleans residents know this. Let a stranger mention oil, and the average person in New Orleans will brag about what the northern part of the state is doing. Yet for two years South Louisiana has been rolling out more oil than North.

North Louisiana			South Louisiana
1927	18,134,852	Barrels	5,032,400
1928	14,837,135	"	7,183,260
1929	13,154,935	"	7,466,893
1930	14,298,534	"	8,681,089
1931	11,964,015	"	9,661,053
1932	9,849,925	"	11,167,260
1933	9,962,540	"	15,540,341

PRODUCES 60 PER CENT MORE

A few years ago, South Louisiana was producing only half as much oil as North. Now it is producing 60 per cent more. To date—including the years before 1927—North Nouisiana has produced a total of 365,357,326 barrels of oil; South Louisiana 143,453,619.

By the proration order issued November 10, 1933, in accordance with instructions from Secretary of the Interior Harold Ickes, South Louisiana is alocated nearly twice as much production as North Louisiana—44,528 barrels a day as compared with 24,300. It will not be many years before South Louisiana will have rolled out a greater volume of oil than North, for production in the South has just begun to gush, so to speak; and explorations in search of new fields are being pushed on a wide front. An enormous wealth represented in the drilling, leasing and production will be poured into this section during the years when it will be most needed and when such a development will reap the greatest harvest—the recovery years after the present disaster has spent its force. This leaven is working now—has been working for months.

220 MILES BY 150

The South Louisiana coastal dome area lies below a line projected from Franklinton through Port Hudson and a point just south of Oberlin. It extends to the Gulf of Mexico on the South. The area is about 220 miles broad by 150 deep. Above this line, the subsurface formation is what geologists call "structure"—bent and folded strata, where oil concentrations are found near faults. Below this line, the formation is salt dome intrusions in mud, clay and sand. Against the broad flanks of those domes, the oil is concentrated.

So to the north, south and west of New Orleans stretches the oil territory of which it is the capital. To the east, in the lower part of Mississippi, exploration is being pushed at an impressive rate. Some operators believe that territory will also be a large producer. But that's another story. If South Mississippi comes in, New Orleans will be the hub of an enormous whirl of oil development.

The South Louisiana parishes which were producing oil at the end of 1933, the names of the different fields, the number of producing wells in each and their daily production are given in the following table, compiled from Conservation Department statistics:

SOUTH LOUISIANA OIL FIELDS

Parish—Field	No. wells	Daily output (bbls.)
Acadia, Jennings	31	928
Ascension, Darrow	1	15
” Sorrento	3	43
Calcasieu Edgerly	18	175
” Lockport	28	2,333
” Starks	18	1,467
” Sulphur	34	2,800
” Vinton	78	3,500
” Iowa	16	12,953
Cameron Bayou Black	3	938
” Cam. Meadows	1	251
” E. Hackberry	49	4,890
” W. Hackberry	19	380

Parish—Field	No. wells	Daily output (bbls.)
" Sweet Lake	5	1,167
Iberville Choctaw	4	306
" White Castle	3	867
Jeff. Davis, Welsh	11	47
Lafourche, Leeville	4	1,913
Plaquemines, Gr. Ecaille	6	563
St. Landry, Port Barre	15	2,005
St. Martin, An. La Butte	3	40
Terrebonne, Caillou Is.	2	247
" Lake Barre	14	6,667
" Lake Pelto	1	47
Vermillion, Gueydan	4	383

A total of 371 wells pouring out an average daily production of 44,925 barrels of oil at the end of 1933.

NEW IMPORTANT STRIKES

More production has come in this year. All the figures have not yet been assembled, but there are details on a few of the more important strikes in 1934:

A new field in Jefferson Davis parish, near Roanoke, was proved by the bringing in of Shell Petroleum Corporation's Kratzer No. 1 at the astounding depth of 8682 feet. This is considered by oil men and geologists to be one of the most important strikes in the development of the entire Gulf Coast. Already a number of wells are going down in the Roanoke field.

Another important strike was made a few weeks ago near Bosco in Acadia parish. Superior Oil Company's Hernandez No. 1 was brought in producing 750 barrels a day from a depth of 7853 feet. At least six wells are being pushed down in this territory.

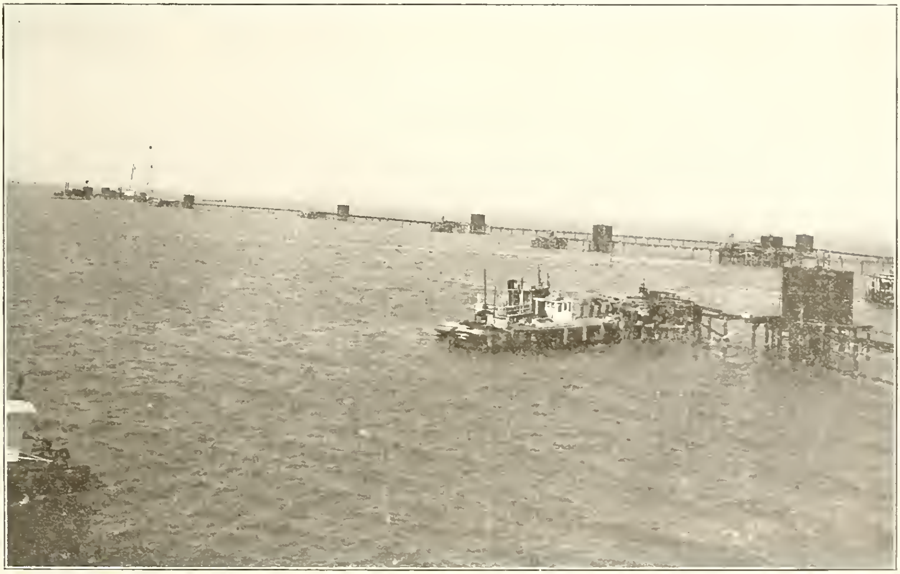
Less than 30 miles from the New Orleans City Hall—as the crow flies—the Gulf Refining Company has found production on the Lake Hermitage dome, in Plaquemines parish. No official figures have been announced.

In Terrebonne parish, the Bay St. Elaine dome proved itself a producer not long ago. No official figures are available.

At least four new-wells, then, have come in this year, and they have stirred development to new enthusiasm.

18 WELLS BEING DRILLED

The Oil Weekly, in its issue of June 11, 1934, lists 18 wells that are being drilled in South Louisiana. These are not all that are going down—only those on which the magazine had authoritative reports for the week-end. P. B. Williamson of New Orleans, a consulting geologist and geophysicist, and an observer of oil developments in the South, estimates that at least 60 wells are now being drilled in this territory—90 per cent of them by the major companies and well-or-



Lake Barre Oil Field, Terrebonne Parish, showing the extent of development in the northern portion of the field.

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The following tabulation of drilling permits issued by the Conservation Department reflects the increase in activity in South Louisiana during the past year:

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Acadia	4	5
Allen	0	1
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Cameron	59	37
E. Baton Rouge	0	1
Evangeline	0	3
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Iberville	2	5
Jefferson Davis	7	23
Lafourche	10	15
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St. Martin	5	2
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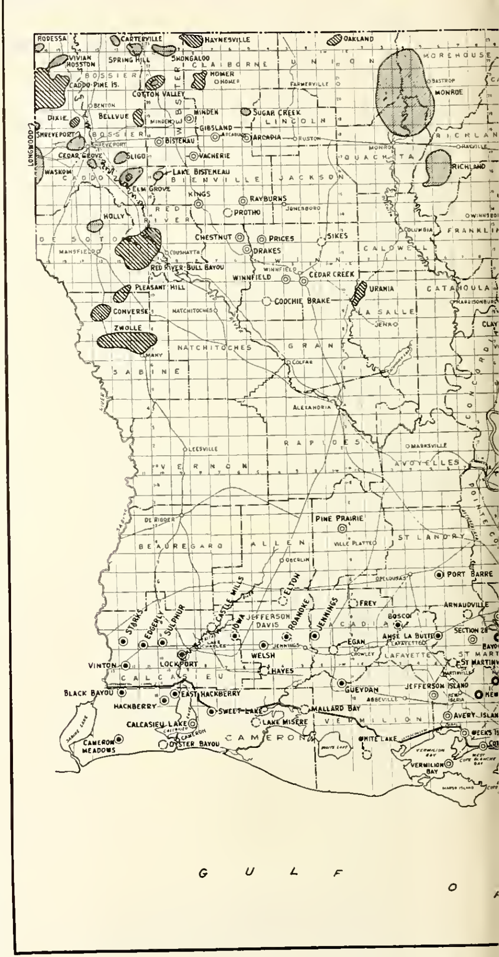
Vermilion	4	7

A total of 283 in 1933, compared with 175 in 1932. The total for the state was 822 in 1933 and 598 in 1932.

WELLS AVERAGE $50,000

To push down a well, Mr. Williamson estimates costs about $50,000. Some cost more, others less, but that is a good general average on proper development. Six to eight thousand dollars go for geological and geophysical explorations, according to his figures; about $30,000 for pipe, drilling and labor, and the balance for other expenses. The iron pipe for the average well—6 to 16-inch casing for a depth of 5000 feet—costs about $11,000. According to NRA labor requirements, there must be three shifts of drillers a day, six men to a shift. A competent driller is paid $12 a day, the "roughnecks" $4 a day up. It takes about two months, on the average, to drive down a well—whether it is a dry hole or a gusher. So a tremendous part of the cost of sinking a well goes into pay roll.

Mr. Williamson estimates that at least $50,000,000 of capital is behind the drive to increase oil production in South Louisiana. This is a stunning figure, but Mr. Williamson is a geologist, not



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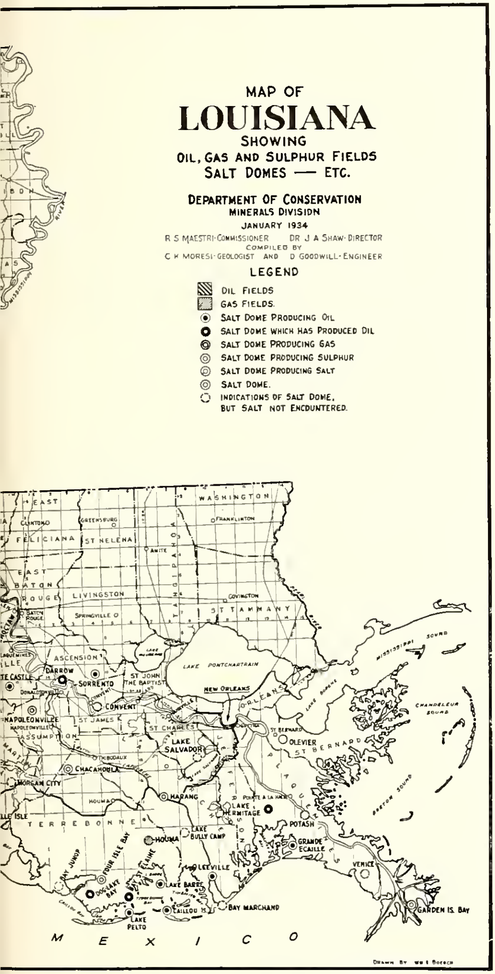

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At $59,000 each, the 375 known producing wells in South Louisiana cost $18,750,000. At $50,000 each, the estimated 60 wells now being put down with represent an expenditure of $3,000,000. The money paid for leases—and the general rule is that no company will drill unless it has at least 5000 acres—and for geological and geophysical expenses, not to mention other costs, runs into millions.

A large part of that $50,000,000 will get into immediate circulation in this territory in wages and material purchases. Assuming compliance with the NRA code, 18 men to a derrick means that more than 1000 men are now drawing wages in drilling operations alone. Several thousand others are making their full living or a part of it serving them: delivering material, supplying them with food and housing, washing their clothes, servicing their automobiles, etc. The oil payments finance the purchase of real estate, the paying of taxes, building and repairing houses, and hundreds of other expenses that add their flood to the river of production which flows from human activity.

$45,000 A DAY

And speaking of wealth—it is conservative to estimate the value of the oil produced at $1 a barrel. In other words, South Louisiana is pouring nearly $45,000 a day through a few hundred inconspicuous pipes. It turned out a wealth of more than $15,500,000 in 1933. It has gushed nearly $143,500,000 since the Division of Minerals of the Department of Conservation was established.

Only a small percentage of the wealth brought up by a flowing well sticks to the community, for most of the pay roll ends when the casing has been pushed down and the connection made to a pipe line; but there are some handling and repair jobs that keep men busy, and every successful well increases the effort to extend the producing horizons and to bring in new fields. From an employment, purchasing-power and prosperity standpoint, the drilling stage is the big time, the period which yields the heaviest dividends to the community. The drilling of one well can keep a small town going after it has reached economic collapse—farmers, merchants, professional men and laborers. It frequently has.

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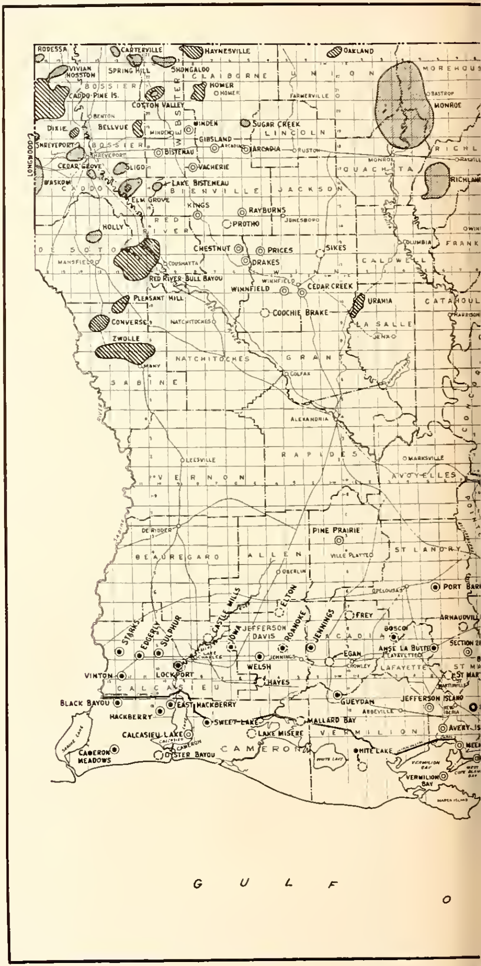

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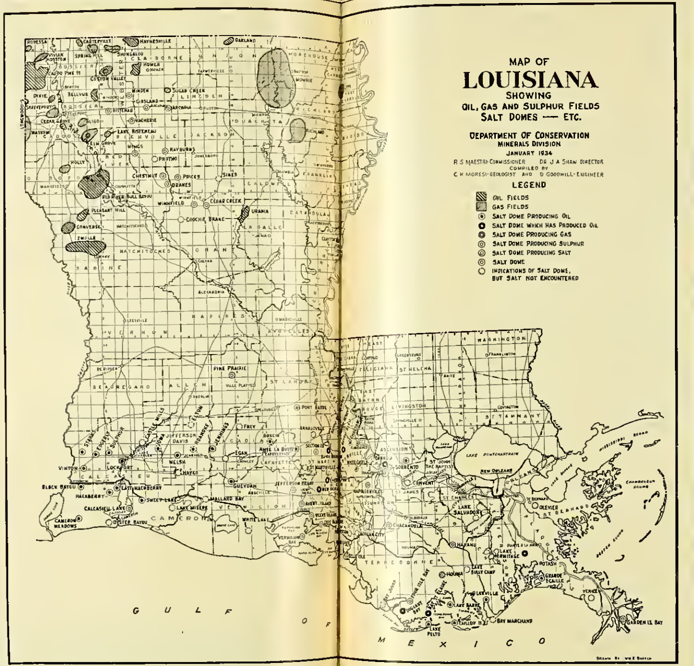
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SALT DOMES — ETC.
DEPARTMENT OF CONSERVATION
MINERALS DIVISION
JANUARY 1934
R S MAESTRI-COMMISSIONER
DR J A SHAW DIRECTOR
COMPILED BY
C K MORESI-GEOLOGIST AND D GOODWILL-ENGINEER
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◉ SALT DOME PRODUCING OIL
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G U L F O F M E X I C O

EDITOR'S NOTE: *Through courtesy of the New Orleans Times-Picayune, the Review reprints the article entitled: "South Louisiana Produces Sixty Per Cent More Oil Than Northern Section of State" by Mr. Thomas Ewing Dabney. The data, as acknowledged by Mr. Dabney, was largely secured from the records and Eleventh Biennial Report of the Department of Conservation.*

The map of Louisiana above shows oil, gas, and sulphur fields, salt domes, etc. This map also shows the various railroad systems, the Intracoastal canal system, and the navigable waterways of the State. Since colors were used in the original map, from which this map was taken, it is, therefore, necessary to explain the legend in detail: Crystalline salt is being mined from the Winnfield, Avery Island, Jefferson Island, and Weeks Island salt domes; Brine from the Hackberry salt dome, Calcasieu Parish, will be used by the Mathieson Alkali Works, which company is erecting a chemical plant in the city of Lake Charles, to produce soda ash. The Solvay Process Company is erecting a chemical plant north of the city of Baton Rouge and will utilize brine from the Choctaw salt dome, Iberville Parish, to make soda ash; sulphur is being mined from the Jefferson Island salt dome, Iberia Parish, and the Grande Ecaille salt dome, Plaquemines Parish. Some 65,000 barrels of oil is being produced daily from 26 fields in South Louisiana, while the total daily production of oil in North Louisiana is 23,000 barrels. The Federal authorities have allocated 88,000 barrels of oil daily to Louisiana for the month of July and should proration orders be lifted, South Louisiana could produce some 50,000 barrels daily in excess of this amount. Some 193,202,645,000 cubic feet of gas was produced during the year 1933 from twenty-two gas fields in North Louisiana. Since January, 1934, three oil fields have been discovered in South Louisiana. A large producing oil well was brought in on both the Roanoke dome, Jefferson Davis Parish, and the Bosco dome, Acadia Parish. A small quantity of oil has been obtained from the Lake Hermitage salt dome, Plaquemines Parish, and the St. Elaine salt dome, Terrebonne Parish. Just recently, July 5th, a large producing oil well has been brought in on the New Iberia salt dome, Iberia Parish.

All illustrations in the above captioned article are furnished by the Department of Conservation, the Times-Picayune declining to lend engravings which accompanied the original article, giving reason that the NRA Code regulations prohibited them so to do. The Louisiana Conservation Review is a state publication and of non-profit character and free distribution.

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IN IMPORTANT POSITION

Therefore, such a statement as this by a recognized expert like T. R. Dean before the National Oil Scouts' Association of America in Lake

Charles, March 21, 1934 (printed in "The Oil Weekly" in its issue of May 28) should be a stop, look and listen sign to business men and to others who try to see further than the ends of their noses:

"The idea seems to be prevalent among those not so well acquainted with the conditions in South Louisiana that this state occupies a relatively unimportant position as a controlling factor in the industry, and there is a tendency on the part of a few to a certain degree to disregard, either as of any significance, either as to present conditions or as to future possibilities. . . The comparative importance of Louisiana has assumed such proportions that an examination will no doubt be a surprise, even to those who are more or less acquainted with the territory in a general way."

Mr. Dean was speaking to a hardboiled, skeptical gathering of oil men. He was not trying to sell them anything. He was reporting the facts as he found them—unembellished facts without any emotional or high-pressure optimism. There are some persons who like to fool themselves on oil possibilities, but not the oil men whose living comes from production. It's cold business with them, and turkey is the only talk they understand.

PIPE LINES BEING LAID

Therefore one is justified in giving full value to every word in Mr. Dean's statement when he says:

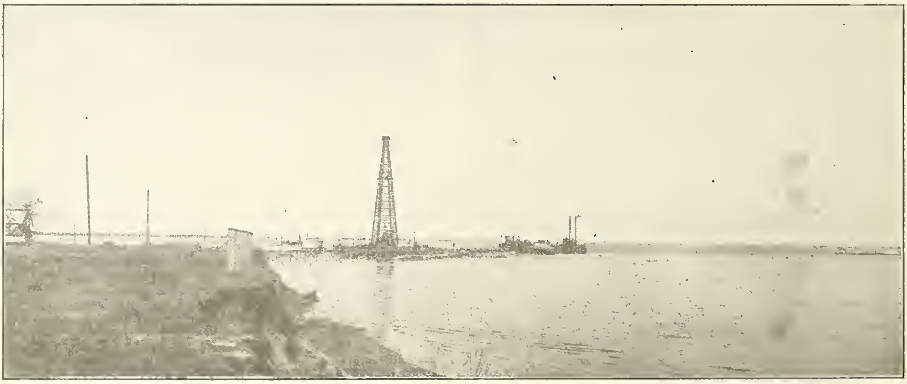
"Present conditions presage for 1934 the greatest strides in all phases of the history of the development in Louisiana. More pipe lines are being laid or contemplated. Indications point to a higher degree of interest in development around a number of the old established salt domes, as several of the major companies and individuals have already shown a tendency toward acquisition of flank acreage and drilling for offside production. A new field has been discovered at Bosco by Superior Oil Company, indicating production as deep as 8916 feet, or within the Oligocene age."

He adds "Heretofore, developments have centered almost exclusively around shallower domes in South Louisiana. We share the opinion of some of the older men best informed on Louisiana, that this is what may be termed virgin oil territory, not only for deep production in the coastal area, as demonstrated at Iowa, Bosco and Roanoke, but also the Jackson and Conroe trend which cannot be overlooked, and where no production has been discovered to date simply because there has not been sufficient exploration or drilling to furnish enough information for success."

2,000,000 ACRES LEASED

Mr. Dean estimates that 2,000,000 acres of land in South Louisiana were leased for oil purposes during 1933, with first payments to the landowners totalling $1,500,000. Some of this land was released after exploration, but he says that there was a total of 2,800,000 acres under lease in South Louisiana at the end of the year—700,000 acres more than the year before; and he adds that between January 1 and March 21, 1,400,000 acres more were leased for about $950,000. "If the present rate of leasing activity is maintained at the end of this year," says Mr. Dean, 'we estimate a total of 3,500,000 acres will have been leased, a considerably greater total than from any previous year."

His figures show also that in January, 1933, there were 18 geophysical parties working in the South Louisiana territory; in July 31; in December, 26; and in March, 1934, 31. Their explorations showed fruits, for "In 1932, there was a total of only 136 wells drilled in South Louisiana,



Well on East Hackberry Dome, Calcasieu Lake composed of 58 fields and 78 wildcats and semiwildcats; last year there was a total of 238 wells drilled, including 164 field wells and 74 wildcats and semiwildcats; or a 76 per cent total increase in the number of wells drilled."

Figures on Producers

So it is necessary to revise upward the statement about the amount of new money which oil exploration and drilling has left in Louisiana. The figures already given include only wells which produced oil; but, of course, there were some that were not successful.

On the lower fringe of the state, where trembling prairie gives way to ocean swells, the eager drillers have already begun to push into the open sea. A new type of equipment has been developed for this purpose. It is a submersible barge. A raised deck holds the drilling outfit; the hull, sunk over the chosen site, serves as the foundation. With this equipment, drilling can be started in a fraction of the time required when conventional piling type piers are used. It reduces the cost, too. A number of drilling operations in South Louisiana are in marshy country or water, so going to sea to get oil is a natural development. Indications are that the oil deposits extend far out beneath the ocean—how far, no one knows yet. But traces of oil have been reported 50 miles at sea.

In Shallow Depths

Such drilling now is confined to comparatively shallow water depths—say 20 feet. But if the world demands the oil, the ingenuity of man will develop the equipment that will enable him to go after it in the greater deeps, and we may still live to see the green waves of our coastal Gulf accented by oil pipes. A few years ago, a thousand feet was a deep well. As late as 1922, drillers spoke of 2000 feet with respect. They still thought of the first oil well—in Pennsylvania in 1848—only 48 feet down; and 2000 feet seemed to them to be a mighty deep hole. But they have improved equipment and methods, and gone deeper and deeper. They have already gone down 11,377 feet—in the South Belridge field in California. Last year, four wildcats were drilled to 8000 feet or below in South Louisiana; three to 7000-8000 feet, and eight to 6000-7000 feet. So we may expect more deep wells, and we may expect the drillers to go to sea when the demand arises.

Drilling a Risk

Drilling for oil is a risk—will always be a risk, for it is reaching for something a mile or more beneath the surface of the ground—or the sea; and the drill stem must be pushed down and the pipe set through obstructions and in formations which cannot be seen and whose pressures can only be estimated. But it is not as great a risk as it was in former years, when the rig was set up where the scenery, in some occult manner, suggested oil, or where the driller's hat blew off, or where he performed incantations with a willow twig or consulted a doodle bug. In one of the large oil territories in the United States, the figures show that 85 per cent of the drillings in scientifically checked locations brought in oil or gas. The average business cannot report such a high ratio of success.

No drilling is begun by a sound company nowadays until geologists, geophysicists and mathematicians have explored the surface formation as thoroughly as is possible.

Surface Studied

First, the geologist studies the surface indications, and draws maps projecting subsurface formation possibilities from the known into the unknown. Then come the geophysical crews. With enormous charges of dynamite, they send vibrations pulsing through the ground. On sensitive instruments resembling those which register earthquakes, these vibrations are recorded, in different parts of the area. The vibrations travel through formations of the same character at a steady rate of speed, but when they strike different formations, they go faster or slower, or they are deflected. There are two different systems of recording vibrations. From the readings of the instruments the scientists are able to plot a map of the subsurface formation with remarkable accuracy. And with torsion balances and magnetic registering instruments, they check on the recordings obtained with these instruments, and compare them with the message of the explosions. These instruments measure the attraction which all bodies of material exert for each other. The heavier and denser the body of material, the stronger the attraction. Everybody knows what the law of gravity is. This force is just as definite as the law of gravity, though its effects are not so obvious, and can be measured only by precision instruments. These methods take most of the chance out of the oil producing industry and are the reason for the tremendous activity in South Louisiana.

In most parts of the world the oil is found in or near strata that have faulted. That is, there has been an earthquake or a displacement of material far below the surface of the earth, and structures of sand, rock, clay, etc., have been broken or pushed up or down. The stratum of sand through which the oil flowed is walled off by some impervious material, and the oil, instead of continuing to migrate further, banks against that fault and forms an accumulation or saturation with a heavy pressure of water or gas behind it.

In South Louisiana there probably are deep-seated structures, and there are salt domes. Domes are only faults under another name—upthrusts of mountains of salt, caused by the shifting of the earth's structure ages ago. These intrusions of solid material block off the oil sands and are a levee against which the migrating oil is held in a constantly increasing accumulation. Oil, by the way, is spread through the length and breadth of the subsurface sands, or would be if it were not for faults or salt domes which cause it to be concentrated. One could, therefore, put down a well anywhere and bring up oil, but it would be in minute quantities. But Nature, by accident—or design—comes to our aid with its earthquakes and earth-shiftings.

Capital Near $39,000,000,000

There may be some drillers today who will put down an oil well without making the proper scientific explorations beforehand. There may be some in South Louisiana as well as in other parts of the world. Years ago somebody made a certain observation about a fool and his money, and the statement is as true now as it ever was. But the responsible companies which are working and are interested in South Louisiana are not among them.

Here is a partial list of those which are leading the great oil attack in South Louisiana—29 major companies and well-financed wildcatters which will come through a Dun and Bradstreet's examination with flags flying—their total capital not far from $30,000,000,000:

Humble Oil and Refining Company, Magnolia Petroleum Corporation, Gulf Refining Company, Superior Oil Company of California, Continental Oil Company, Rio Bravo Oil Company (Southern Pacific railroad), Amerada Petroleum Company, Danziger Oil and Refining Company, Shell Petroleum Corporation, Atlantic Oil Producing Company, Stanolind (Standard of Indiana), United Gas Public Service Company, Standard Oil Company of Louisiana, Texas Gulf Sulphur Company, Freeport Sulphur Company, Tidewater Oil Companp, Rycade Oil Company, Pure Oil Company, The Texas Company, Barnsdall Oil Company, Strake Oil Company, Standard Oil of Kansas, Ohio Oil Company, Cranfill and Germany, Benedum-Trees Oil Company, Mills Bennett Oil Company, Sun Oil Company, Yount Lee Oil Company, Union Sulphur Company.

Well-Known Scientists

And here are the names of some of the nationally known consulting geologists and geophysicists who are interested in this area now: John Weinzierl, V. E. Karnes and Lee Hager of Houston; W. R. Calvert and Geophysical Research Corporation of New York, and the Petty Geophysical Engineering Company of San Antonio, besides Mr. Williamson, who came to New Orleans from San Antonio.

Sometimes a company will spend a quarter of a million dollars on exploration before it sticks a drill into the ground. Then it will begin operations on a large front. It will not bring in a well every time. It does not expect to. But its average is good enough to make the industry profitable, tremendously so. The geological-geophysical studies do not guarantee the presence of oil; but you can be perfectly sure that there won't be any oil where the readings don't indicate what the oil man calls closure—no matter how many hats may have blown off.

The difficulty of finding oil, and the costliness of bringing it in, after its general location has been learned, emphasize the importance of the oil work being done in South Louisiana. Millions of dollars would not be spent on geological and geophysical explorations, wells would not be pushed down by the hundreds, land would not be leased by the thousands acres if the lower sands contained nothing damper than water.

Only First Spoutings

The oil is here—production proves it—and the increased activity shows that the big operators believe they have caught only the first spoutings. The heavy activities going on to the east of New Orleans should upset the common superstition that there is no oil in the Southeast of the Mississippi.

The difficulty and costliness prove also that one should be most careful in buying oil stock. A conservative estimate by a reputable oil man shows that probably more than $500,000 has been taken out of New Orleans since January 1 by oil stock salesmen and lease sellers who had a glib tongue and pretty blueprint. If this money had been tossed into the Mississippi river, it would have as good a chance of coming back. Two hot-shot promoters alone have taken $350,000 out of New Orleans, Lake Charles and Beaumont since the first of the year, according to reports.

A great many oil promoters are dishonest. The blueprint is the only thing behind them. Some

(Continued on Page 43)

The Louisiana Oyster, Its Habits and Value

Radio Address by James N. McConnell, Director of the Oyster Division of the Louisiana Department of Conservation, at the request of the New Orleans Young Men's Business Club,—Delivered over WWL on June 12, 1934, at 5:15 P. M.

IT is indeed with a deep feeling of appreciation, Mr. Treleaven, that I accept this opportunity, on behalf of the Commissioner of Conservation, from the New Orleans Young Men's Business Club, to address the radio audience on a subject which is of such great interest and importance to the people of this and our neighboring State of Mississippi.

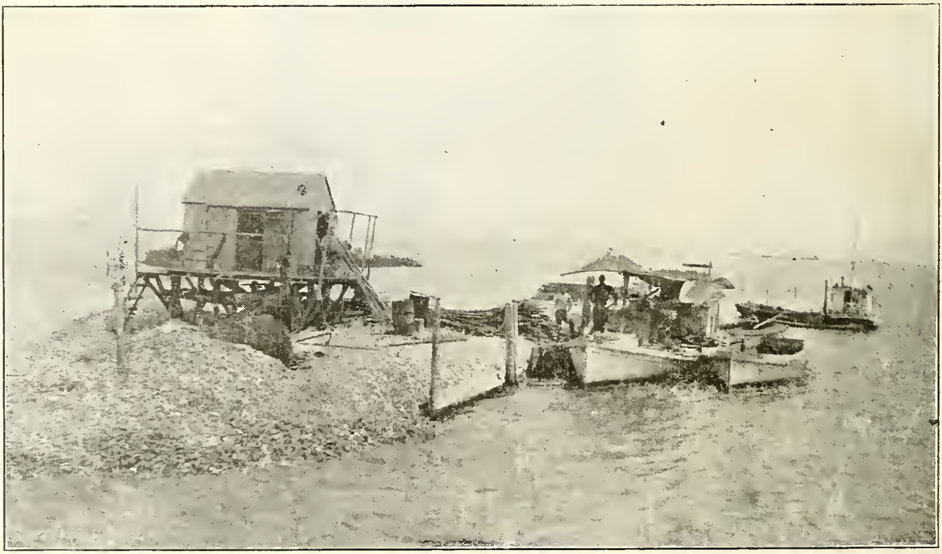
Of the innumerable valuable natural resources of the State of Louisiana, oysters are one of the most important. The function of the Oyster Division of the Department of Conservation is not only to assist in the conservation of this valuable resource, but to cooperate to the utmost in the development of the industry, which has grown to such tremendous proportions in our State. An endless number of experiments have been and are being conducted with the view to improving the quality of our oysters and to insure to posterity an ever-increasing supply. Our efforts are tireless in supporting and assisting the legitimate activities of the splendid people engaged in the oyster industry, and our prosecution of violators of the laws enacted for the protection of the oysters and the industry are rapid and fearless. The Department of Conservation indeed welcomes this opportunity of coming before you to discuss this most fascinatingly interesting subject. Very few laymen know more about the oyster than that it is good to eat. It is my pleasure, as Director of the Oyster Division of the Louisiana Department of Conservation, to give you a few of the highlights in the life and ultimate fate of this queer looking mollusk we call THE OYSTER.

JAMES N. McCONNELL,
Director, Oyster Division

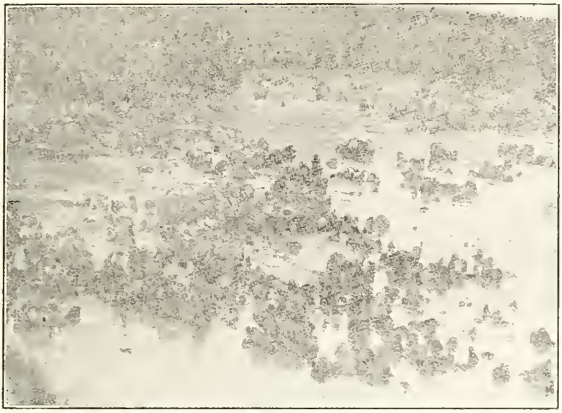
The "Louisiana Oyster" has been acclaimed by one of the greatest living authorities, Dr. P. S. Galtsoff, in charge of the oyster fishery investigations of the U. S. Bureau of Fisheries, as "the most delicious tasting oyster" he has found throughout his world travels in search of oyster information. The Louisiana Oyster has become widely and well known from one end of our country to the other. With 200 times the iodine content as milk and eggs, and 13 times as much iron as milk, this sea food has been recognized widely by the medical profession as a major item in diets prescribed for persons suffering from pernicious anaemia, goitre and other disorders arising from improper mineralization of the human body. Vitamin C, that energy-element so important to good health, is found in abundance in the Louisiana oyster. Oysters are remarkable among ordinary food substances in their high proportion of glycogen, a substance resembling starch but more readily and easily assimilated, and, unlike starch, wholly digestible even when uncooked.

To make this delicious food available, the oyster industry has developed three main branches, known respectively, as steam canning, raw shops and the sacked oyster or counter business. Time does not permit me to dwell at any length on this phase of the subject. In brief, raw shops are those establishments which receive either from their own fishing activities or from independent fishermen the live oysters which they shuck and can and which are refrigerated until they reach the ultimate consumer. Raw shops also sell shucked oysters in bulk, and they usually handle other fish and sea foods as well. Houma, that thriving city in Terrebonne Parish, is the hub of this phase of the industry and is known from coast to coast as the Oyster City of the South. Sacked or counter oysters are live oysters delivered in the shell to the retail establishments where they are shucked for sale in bulk or over the counter on the half-shell. The oyster bars of New Orleans are famous throughout this country and connoisseurs visiting our city gravitate to these establishments to enjoy the unexcelled flavor of the Louisiana oyster. Steam canning has assumed the proportions of a major industry and Louisiana canned oysters are on sale everywhere throughout this country. This industry affords employment for a vast number of workers. Biloxi, Mississippi, is justly proud of the fact that more steam-canning plants handling Louisiana oysters are located there than at any other point on the Gulf. There are a number of steam-canning plants located in our coastal parishes but Biloxi, Miss., with 17 plants is the recognized center of this branch of the industry. During the oyster season just past the output of these Mississippi plants consisted 100% of Louisiana oysters. Everyone who is interested in the industrial development of Louisiana will be impressed by the fact that though Biloxi, Miss., is the center of the oyster canning industry, it is the Louisiana oyster that is used throughout the United States as the standard of comparison and the unit of price fixing—all because of its superior quality.

One of the most interesting phases of this subject is the sex life of the oyster. The Department of Conservation is proud of the fact that through its research efforts, M. D. Burkenroad discovered that not only is the Louisiana oyster bi-sexual, but the individual oysters change their sex during the course of their growth. The oyster is first a male and later a female. The oyster becomes a sexually mature male in the same spawning season in which it is born. After it has grown to a size of about two and one-half inches, and is ten to eleven months old, there is usually a sex metamorphosis. When the oyster is developing spawn for its second breeding season, it produces eggs instead of sperm. Observations have proven, however, that this change does not invariably take place, and probably will not occur if the mouth of the shell of such an oyster is very close to the mouth of the shell of a female oyster, the first retaining its sex as long as it is in close association with the female. However, if separated, it will probably become a female itself. Such a modification of sex in an animal by the presence of other individuals is an extraordinary occurrence zoologically, only two other cases having been known.



Typical Oyster Camp Including Lugger and Skiffs



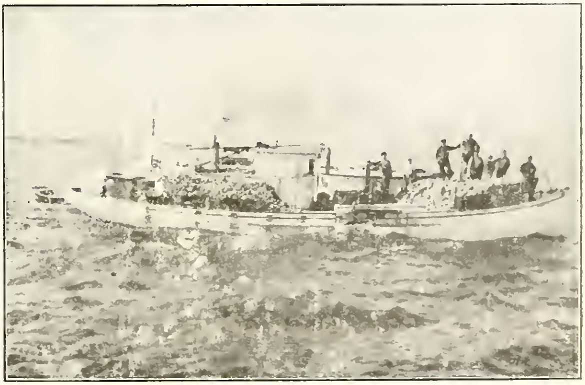
OYSTER BED AT LOW TIDE
From this it may be seen how, in the old days, oysters were gathered without the aid of tongs.

In addition to being an interesting observation, the sex metamorphosis of the Louisiana oyster assumes a practical importance in considering the cultivation of oysters with the view to steadily increasing the supply. This sex modification means that all the young oysters which usually settle on the shells of other older individuals will be male. Clumps composed of many oysters growing very close together, as on the natural reef, will include both males and females. However, the large oysters, which are growing apart from other large oysters, whether naturally or because they have been culled, will almost all be females. The most important conclusion to be drawn from Mr. Burkenroad's studies is that this sex modification of the oyster is a mechanism for ensuring the presence together of both males and females, and the consequent fertilization of a large proportion of the free-floating eggs, which, in turn, makes possible a plentiful supply of spat.

Without burdening you with a discourse on the biology of the Louisiana oyster, I desire very briefly to acquaint you with how this mollusk comes into being and the method of its development into the delicious food of which most of you undoubtedly are very fond. Breeding oysters are called milky because of the milky-looking fluid which they exude at that time. The milk of the female is composed of millions of minute eggs; that of the male, of an incalculable number of extremely small spermatozoa. A large female has been estimated to contain 100 million eggs. The milk is cast out into the water, where the sperm of the male drifts or swims to the egg and penetrates it. This act of fertilization begins the cycle of oyster life. After fertilization, the oyster egg divides again and again forming a ball of many tiny cells. In the course of a few hours, small vibrating hairs, known as cilia, appear on the developing young oyster. With these cilia it keeps itself suspended while being drifted about by the winds and the currents. Presently, this embryo develops a pair of tiny shells. These shells grow larger and heavier and finally the young spat drops to the bottom to attach itself to some hard object, and give up forever its power of moving from place to place. The young spat can only attach itself to a clean surface, and after attachment while still very small it is easily smothered by sediment. To insure against the loss of these valuable little fellows by being smothered, the Department of Conservation beds empty shells each year. You will find it interesting to keep the salient points of the foregoing discussion in mind for a few minutes as I shall tell you a little later more about these bedding activities and the results which have been accomplished.

The oyster, because of its fixed position, is unable to go in search of food, and for that reason nature has so equipped this animal that it is able to obtain food from the water in close proximity. The tiny, beating hairs which enabled the larvae to swim about, in the attached oyster create water currents that carry to it the microscopic floating plants which form its principal food supply.

The life of the oyster is not what one might call a bed of roses, for young and old have many

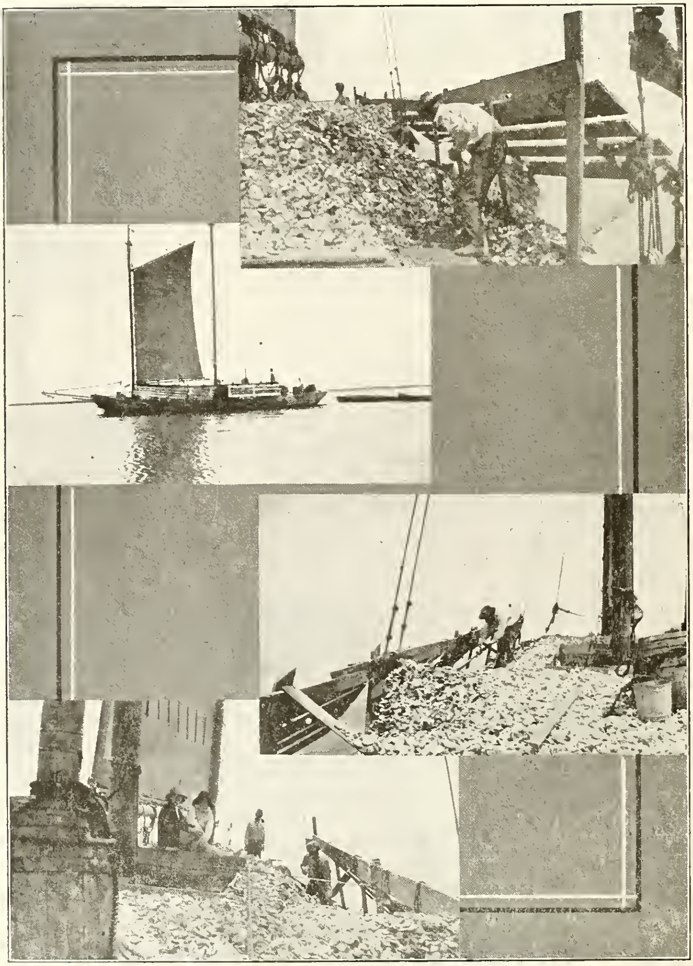


Dredging Oysters in Louisiana Waters With Modern Equipment natural enemies and the toll they take each year is tremendous. In the first place, oysters cannot live in pure seawater, nor in fresh water. They must have a mixture. The percentage of saline seawater may be from 20% to 50%. It is most significant that Louisiana has a greater area suitable to oyster culture than all the other oyster producing states combined. Over a half million acres are available here. During the fall and winter of 1932-33, approximately three hundred thousand sacks of cultivated oysters were killed in the parishes of Terrebonne and Lafourche. The cause for this very large loss has not been positively determined as yet, but suspicion has been cast on oil operations in this area. Quantities of waste oil have been found on the surface of the waters in the various bays where undue mortality occurred. Comprehensive experiments are being conducted at the present time by this Department and the U. S. Bureau of Fisheries have made several investigations and they, also, are making experiments the results from which will undoubtedly prove interesting and beneficial.

Excess rainfall and the overflowing of fresh water streams into the oyster producing areas reduce the salinity of the waters to the extent that frequent large losses of cultivated oysters occur.

The principal enemy of the oyster in this locality is the conch or drill, as it is usually called, which attaches itself to the oyster and bores a smooth round hole through the shell, then extracts the meat. The oyster has, of course, no natural defense against this enemy. The saltwater drum fish also cause big losses in the bedding grounds by crushing the oysters and eating the meat. These fish sometimes congregate in large schools and as they weigh as much as fifty or sixty pounds and are voracious eaters, they have been known to completely destroy a bedding ground in a single night.

Other parasitic animals, boring clams and sponges contribute to the annual losses, and grass or sea weed may foul the shells with resulting mortality. Unfortunately, time will not permit me to go into the subject of prevention of these losses from natural causes, although I can assure you that no effort is spared and the results have been most gratifying, particularly when compared with those obtained in other oyster producing areas.



Bedding Shells

There are two methods of oyster cultivation used in Louisiana; the planting of oyster and clam shells as "cultch", and the gathering of seed oysters from the natural reefs, which are broken up and scattered singly in specially selected grounds. By "cultch", I mean that bed of smooth, hard surface which is provided by the open shells and to which the spat (or young forming oysters) may attach themselves. If you can visualize the countless billions of spat which result from the fertilization during the breeding season, and can picture them settling to the bottom as quickly as their shells have become so heavy they can no longer remain suspended in the water, and, if you will recall that to settle into the silt or other soft matter will prove fatal, it should not be difficult to deduce that the activities of the Department of Conservation in rebedding shells is providing for Louisiana a vast, ever-increasing producing area. This can mean but one thing—that no fear of depleting the supply of Louisiana oysters need be felt so long as this shell-bedding practice is continued.

The progress of the oyster industry depends on three main factors: (1) natural conditions in a given section of the coast; (2) labor and market requirements, and (3) State and Federal legislation regulating the fishing and handling of oysters.

In all of these, Louisiana is particularly fortunate: having an available area for the culture of oysters comprised of more than a half million acres,—a coast line with broad frontage on salt marshes, far away from human habitation rendering the oyster grounds immune from sewage pollution. The open winters make it possible to fish for oysters without interruption during the entire season. There is a greater abundance of experienced labor here than in any other oyster-producing area. Our people have for a great many years recognized the value and the necessity of looking to the waters which lap our shores for their livelihood, and they have progressed with the business, adopting and putting into practice the principles which have been developed by the Department of Conservation and the U. S. Bureau of Fisheries to aid this industry. We have a natural market at our very door. Transportation facilities enable shippers of the Louisiana oyster to make known its wonderful qualities far and wide throughout our country.

A remarkable fact is that even though tremendous strides have been made in the past twenty years of organized effort, the opportunities are still as great, probably greater, today than ever before.

The lawmakers of our State have always been very forward thinking in their consideration of the problems of oyster conservation and the development of this most important industry. Through legislation it is possible to lease the forty odd thousand acres of natural oyster reefs, which are covered with wild oysters, for a period of fifteen years, with the privilege of renewal for ten years, at the surprisingly low figure of $1.00 an acre per year. Through legislation, this Department is enabled to and does with assiduity patrol the water bottoms. Violators of privileges, destroyers of bedding grounds or the oysters themselves are brought speedily to justice.

In 1929 the Department of Conservation, looking forward to the perpetuation and development of the oyster industry in Louisiana, issued an edict requiring all packers to return ten per cent (10%) of all oyster shells opened by them during the season. These shells are bedded under the supervision of this Department and are placed on the bottoms without cost to the State except for the small amount paid for supervision. In May, 1929, 60,000 barrels of clean shells were bedded as cultch. Since that time the amount has steadily increased. This year 78,000 barrels of clean shells were placed in chosen spots and will serve as the resting place for millions of the young spat resulting from this summer's breeding, and in two years time we can reasonably expect an increase of four to one or approximately 310,000 barrels of mature oysters ready for the market from this planting alone.

The progress this State is making through its work of conservation is due in a large measure to the intelligent cooperation of the public in all of the activities of this Department. This attitude now manifests itself in all lines of conservation activity and is growing from year to year as the benefits of conservation become better known. Real control and conservation come only through co-ordination of science and experience, aided by the cooperation of the people.

For the hot summer months, let me highly recommend to the business men, desiring to retain their morning enthusiasm, a light lunch of one dozen raw oysters which the new, speedy methods of transportation now make available.

If I have been able to acquaint you a little more intimately with our mutual friend, the Louisiana Oyster, I count this time very well spent. Let it never be said "They are just oysters", for, in truth, they are Louisiana oysters. Healthful; delicious; medicinally nutritious. And are unexcelled anywhere in the world today.

I thank you.

Making Water Walk in the Tennessee Valley*

By GUS LENTZ

(Photographs by the Tennessee Valley Authority)

"YES, sir! Hit used to run off and now hit walks off." This was the comment of an East Tennessee farmer on the effect of soil erosion check dams constructed on his hillside farm to control the run-off of rain water. His is an apt description of what is being accomplished by the twenty Civilian Conservation Corps camps operating in East Tennessee under the direction of foresters and erosion engineers of the Tennessee Valley Authority and the United States Forest Service. The observation is general among the many land owners in the Norris Lake area where erosion by and large was formerly accepted by many as an act of God, concerning which nothing could be done.

Probably the outstanding case of land misuse is that of the farmer who, to save building fences to separate his fields, encouraged the formation of gullies. He plowed double furrows straight up and down the hillside. Within a year or two the resulting gully six to ten feet deep had made a barrier his cattle could not cross. This is an extreme case. There are, however, many areas in the region with slopes up to seventy-five per cent where open cultivation of corn and tobacco is practiced, and where excessive soil erosion is taking place. The steepest slope found planted in corn was checked with an Abney hand level and was found to be eighty-eight per cent. How such slopes can be tilled without danger to life and limb is hard to understand.

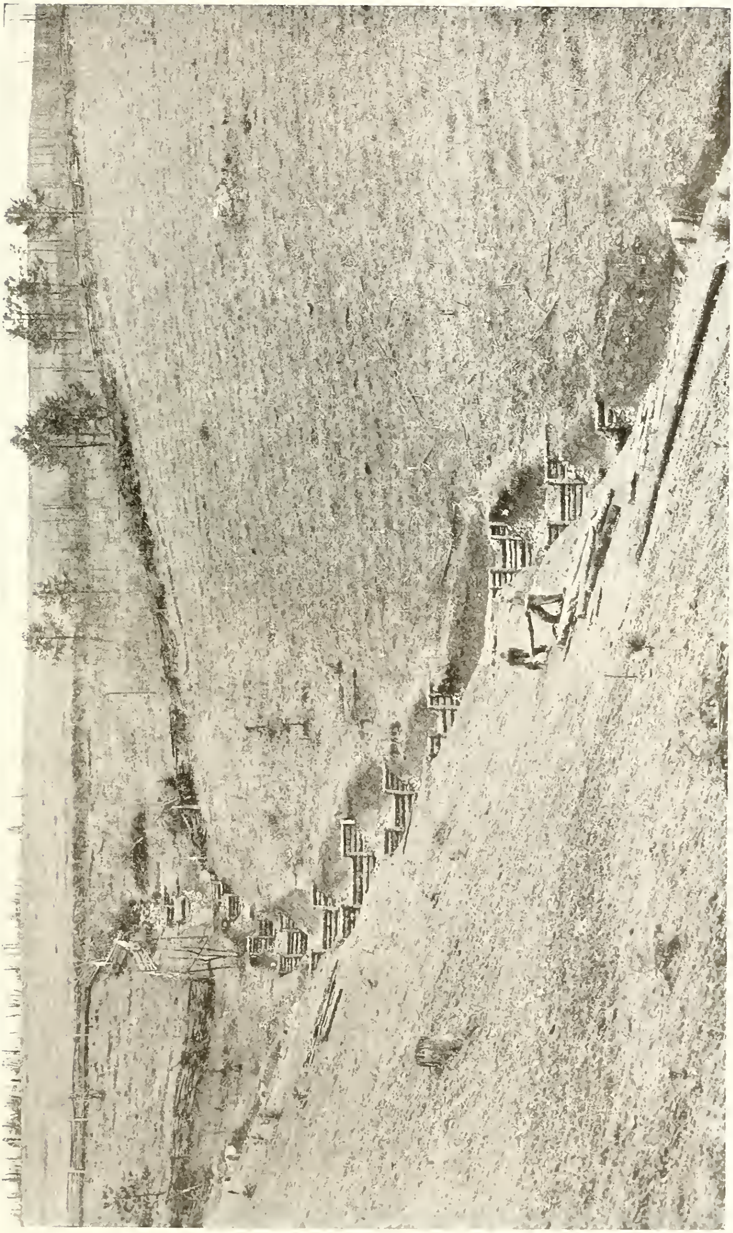
The act creating the Emergency Conservation Work and the C.C.C. camps definitely provided that erosion control should be one of their major objectives. In like manner, the Norris Bill providing for the creation of the Tennessee Valley Authority specifically states that one phase of the work in the 25,600,000 acres of the Tennessee Valley should be the erosion and flood control measures which foresters have proved to be efficacious in other regions. Without using vegetative cover on a large scale no lasting control of erosion on the steep slopes can be obtained. Hence the problem is primarily one for the forester with the aid of the agronomists and the agricultural engineers.

The Tennessee Valley project is the most ambitious and intensive attack in the eastern United States on the problem of controlling soil erosion on a large scale. The building of check dams is only the initial step in this control undertaking. Areas already too far gone for reclamation for farming purposes are to be reforested; other areas where sheet erosion is taking place are to be converted into pasture or planted to protective cover crops such as lespedeza. Erosion control was first inaugurated by the Tennessee Valley Authority in the Norris Lake area because of the seriousness of the problem there and its direct relation to the whole Norris Dam development. With an estimated investment of some $38,000,000 for the construction of the 250 foot Norris Dam on the Clinch River below Cove Creek, the expenditure of considerable time and effort for the protection of this investment is also justified.

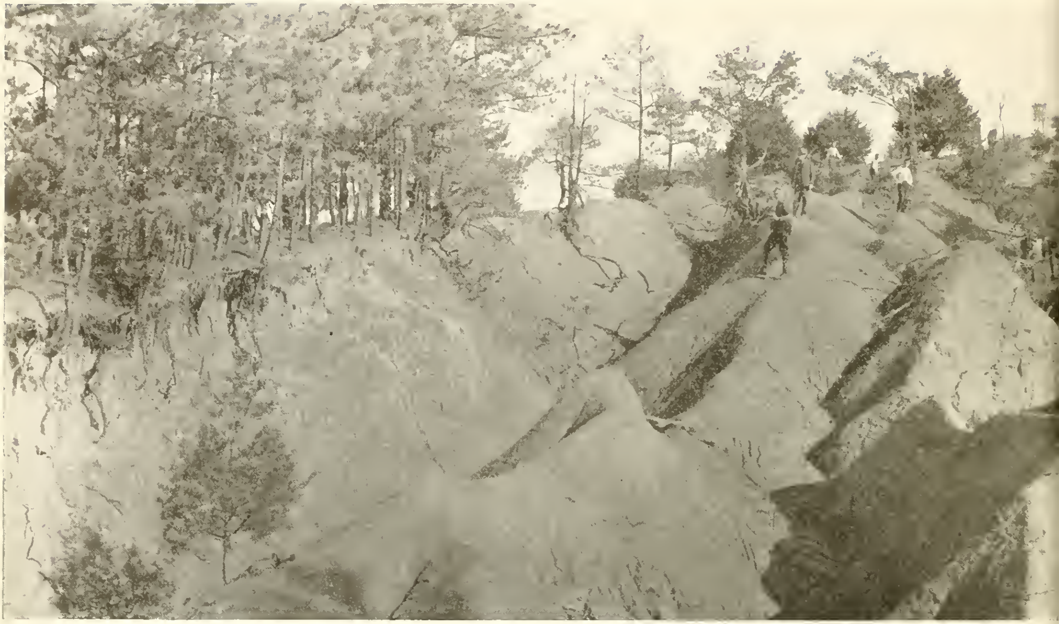
The area which drains into Norris Lake is the watershed of the Clinch River and Powell Creek, the latter joining the Clinch River at Agee. This drainage area extends well into southwestern Virginia and is estimated to include 1,856,000 acres of farm and forest land. Erosion control work was inaugurated in the lower 500,000 acres of the watershed lying in East Tennessee on account of its close proximity to the dam, and of the fact that erosion is most active and critical in this portion of the basin. The area is therefore serving as a proving ground for the entire undertaking. The eroded lands above Cumberland Gap on Powell Creek and along the Clinch River into southwest Virginia will be attacked next. It is hoped that more men and camps will be available later so that other drainages can be worked in the future well in advance of the completion of additional dams.

The T.V.A. Division of Forestry and Soil Erosion in planning the control work, is setting up the specifications for the check dams and for the forest plantings. It is also inspecting the work done. This function is similar to that of an architect on a building program. The United States Forest Service is furnishing the camp superintendents and the project foremen, whose services may be likened to those of a contractor who actually handles the men in the field. The men themselves were chosen by the Labor Department and assigned to the Army Fourth Corps area. It is the army officers' responsibility to care for the wants of the men in the camps, to feed and clothe them and to furnish a maximum number of workmen to the Forest Service super-

*Courtesy "American Forests", Washington, D. C.



"Hit used to run off and now hit walks off," said the East Tennessee farmer, commenting gratefully on the effect of soil erosion check dams on his hillside farm, in controlling the run-off of rain water. Log check dams here control the gully caused by lack of proper drainage.



This picture typifies a hill farm completely ruined by erosion. All the top soil has been lost and the remaining material is flaky shale, on which even scrub pine has a hard time existing. There are many areas in the region with seventy-five per cent slope, where open cultivation of corn and tobacco is practiced, and where excessive erosion is taking place.

intendents each day. Funds to carry on the work are provided through the Emergency Conservation Works appropriation.

In the twenty Tennessee Camps under the T.V.A. there are approximately 4,000 men ranging in age from eighteen to forty-five years. In each camp local men comprise from twenty to forty per cent of the personnel. The balance are men largely from New York and New Jersey. Owing to the fact that most of the C.C.C. enrollees were absolute strangers to the region they and their work were at first viewed with distrust and alarm by these Tennesseans of Anglo-Saxon origin. The whole program was so new and strange to the mountain people that they even misinterpreted the abbreviation C.C.C. One notary in securing contracts for areas around the Lake referred to the C.C.C. as the "Citizens Conservatory Cooperation." When it was first learned that C.C.C. camps were to be established in the area, a hill farmer asked one of our erosion engineers: "Where are them boys coming from?" When told that they were being transferred from camps in Idaho and Montana, but had originally come from New York City and New Jersey, the farmer threw up his hands and exclaimed: "My Gawd! Furriners."

It is a tribute to all concerned that this feeling was soon dispelled and in its place there has developed a real spirit of cooperation and good fellowship, so that the notary's misinterpretation was not such a bad mistake after all. The boys. through their willingness to work and through the results of their early efforts, are now on most friendly relations with the people on whose land they are working.

When the C.C.C. boys came into the Norris Area the T.V.A. owned no property and all work had to be planned for private land which the T.V.A. hopes ultimately to purchase. Working contracts were drawn up, signed by the land owners in the presence of notaries. Only after this written permission was obtained was work undertaken. This procedure has kept several men busy getting contracts signed up ahead of the dam builders. Where for a time we had "to sell" the land owner on the value to him of erosion control, we now have many owners coming to the camps asking that their lands be signed up for control work. There are still a few conservative individuals whose lands are washing away at a rapid rate and who want no C.C.C. help. They advance interesting reasons. One negro farmer told us: "The Lawd has made them gullies and

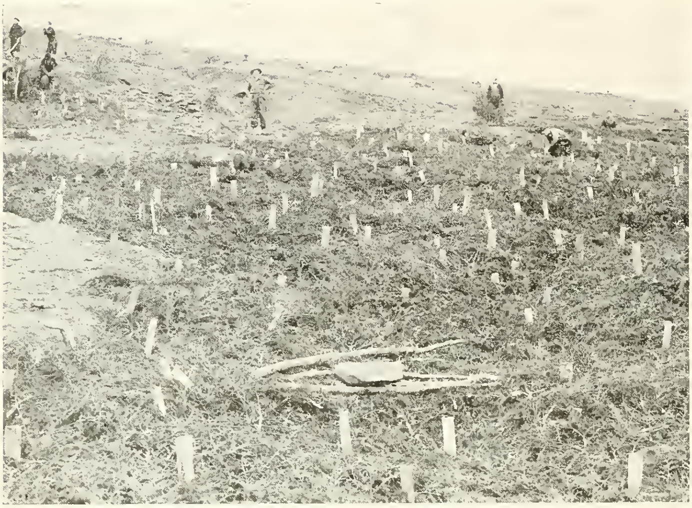
He must have need of them. I aims to keep 'em."

Our method of attack on these eroding fields, pastures and abandoned farm lands differs with each area, depending upon such factors as steepness of slope, size of drainage basin, type of soil, nature of existing vegetation; and in many cases, the kind of material close at hand. There is an erosion foreman in each camp, whose duty it is to survey and determine the area of each separate watershed, prepare a sketch map showing the location and size of all gullies, calculate the maximum run-off and then plan and locate where control measures are to be put and what type to use. In this work the foreman has the cooperation and help of the erosion engineers in the T.V.A. Forestry and Soil Erosion Division, who go over plans with him and help work out the procedure on the critically eroded areas. Each project is thus planned ahead of the work crews and in advance of the dam builders. With soils varying from sandy loams to clay and shale, and with slopes from nearly level to ninety per cent, it is not difficult to visualize the many possible variations and types of erosion with which we have to contend.

During the past fall and winter, work was concentrated on the construction of check dams to catch soil and to slow down the run-off. In addition brush matting was laid and staked in place in order to hold the soil from washing from bare spots where no vegetative cover existed. Four general types of check dams are being used: bag dams, brush dams, log and plank dams and dams built of rock either with or without the use of mortar. Burlap bags partially filled with top soil, over which is sprinkled a handful of grass seed, are used in the shallow troughs or washes where gullies soon would form. Brush dams are used in the shallow gullies already too deep for control through the use of bags. In deeper gullies, log dams or plank dams, not over five feet high, are used. Finally, toward the lower end of deep gullies, or where a permanent drainage will always exist, rock and rock mortar dams up to eight feet in height are built. In many cases the slopes are too steep to adopt the usual engineering rule of having the water from one dam back up to the apron or base of the dam next above. In order to reduce the number of dams otherwise required on such extremely steep slopes, intermediate dams are omitted and instead the gully banks are matted with brush or, in extreme cases, are paved with rock to prevent further cutting in the channel.

The C.C.C. boys have pitched in wholeheartedly, have learned how to handle a pick and shovel;

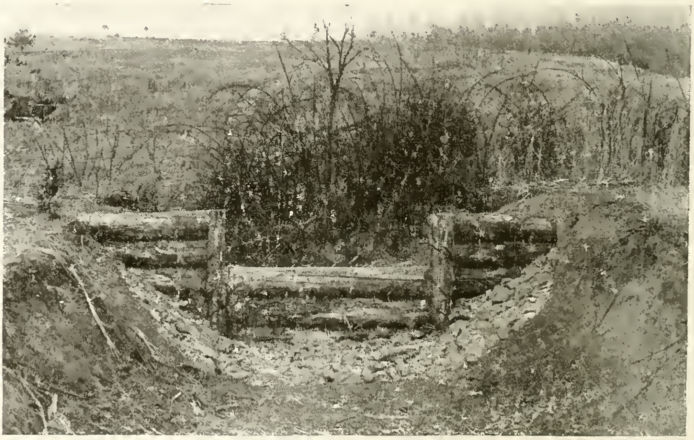
C.C.C. boys hard at work making the policy of erosion control an actual fact in the Tennessee Valley. First steps in the building of check dams to catch and hold silt from the eroding areas until a permanent vegetative cover can be established.



Preparatory to planting, cedar brush matting is staked down on the bare, eroded spots. Grass seed, scrub pine and cedar are later to be planted on this area.

they can now swing an ax and pull a cross-cut saw, and at check dam building they have shown wonderful results in helping to make the water "walk off." The "Furriners" may not have been quite as adept at handling tools as the local farm boys, but all work on an equal basis when it comes to building check dams. The record for one week's work for a camp runs well above 200 rock dams or at the rate of better than one dam a week for each man, and these dams average four feet to the wier notch with widths up to eight and ten feet. More than 10,600 rock dams had been constructed up to April 1, 9,700 log dams, 16,000 brush dams and 18,000 bag dams. In addition, more than 318,000 yards of brush matting have been staked down on badly galled spots. Anyone having an idea that these boys have not been working need only keep their eyes open as they drive along any of the highways between Cumberland Gap and LaFollette or Knoxville, or along any of the dirt roads in the "hinterland" and they will see tangible results of much hard labor. It is a pity that they cannot also see the keen but friendly rivalry which exists between crews and the splendid *esprit de corps* exhibited by all.

Building check dams, or "brakes" as the farmers call them, is only the first step in the concentrated attack on the gullies and eroding fields. Dams in themselves will not solve the problem and once their catch basins have filled up with silt they will no longer serve as complete erosion checkers. Their purpose is to check the rate of run-off and to hold the soil in check until a vegetative cover of grass, vines, shrubs and especially trees can be established. Much of this eroded and eroding land should never have been cleared and cultivated and the gullies now present show the fallacy of the type of land use employed on these steep slopes. Terraces might have helped hold the soil in place on some of the gentler slopes, but gentle slopes are in the minority in this region and even the terrace-minded agricultural engineer often has to admit that terracing isn't the answer to the problem. The primary problem, therefore, is to get these eroded areas planted to grass and trees so that muddy silt laden water will not run off of these slopes, but instead clear water will "walk" into



A log check dam with a vegetative cover already established behind it. This is the type of dam built in the shallower gullies by the men put to work by the great land restoration project under way in the Tennessee Valley.

Norris Lake along its entire 950 miles of shore line. Little Caney Creek must be robbed of the shale it carries from steep corn lands; Hogskin and Crackerneck Creeks must be made to run clear. Erosion must be stopped in Kettle Hollow, Tater Hollow, Blue Mud Hollow, Do-Help-Me Hollow, not to mention Poor Land Valley, Lonesome Valley and many others.

All types of vegetative cover are being tried by the foresters. Bermuda grass is planted behind the dams, lespedeza is sown along the banks and on areas where sheet erosion is active; even the much hated honeysuckle has a place where it can serve as a gully control agent without twining itself around valuable trees. But, after all is said and done, the greatest soil holders are trees, and trees are being planted by the millions. Not only the admittedly efficient black locust, but trees of much greater timber value such as black walnut, tulip poplar, various oaks and pines and even a few blight resistant Asiatic chestnut are to be planted. The grasses and lespedeza will help hold the soil until a forest cover has been formed. On other areas, more valuable for pasture than for timber, grass and lespedeza may have to handle the job alone.

On a trip I recently took up Clinch River, my guide and companion, an old saw mill operator, pointed out to me areas he had logged off twenty to thirty years ago. He recalled the large trees, chestnut, yellow poplar and oak he had cut from dense forests before the lands were cleared for corn and tobacco. He told me that before farming started there had been no erosion from even the steepest slopes and the streams ran clear and free from silt the year round. Now these same slopes are cut into ribbons by deep narrow gullies; bare, galled spots are everywhere present and, during severe storms, silt, gravel and even rocks are carried into the valley. Such areas present a challenge to those connected with the Tennessee Valley erosion control program. The challenge is being accepted and we feel that many of us will live to see the day when these same sub-marginal lands are again in timber and when the streams will again be free of mud and silt. This will have been accomplished as a result of the far-sighted plan envisaged by President Roosevelt and made possible through the efforts and labor of the boys of the Civilian Conservation Corps.

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SOUTH LOUISIANA PRODUCES MORE OIL

(Continued from Page 32)

promoters are sincere but don't stand a chance of success because they are not sufficiently capitalized. It is stretching optimism to hope to put down a $50,000 well with $10,000. Most business failures are caused by insufficient capital. Oil does not have a monopoly on that grief.

Not Selling Stock

The major companies are not in the open market selling stock in oil wells. The more important wildcatters sell stock to their connections and friends. Other wildcatters with many successes sell stock to the general public. It is easy to tell the difference between the stock proposition that has a chance and the one that doesn't. The approach of the salesman is the sure indicator. If that approach leaves you dazed and doubtful—for if you are not an oil expert, a little science will fog up pretty quick—the chances are that he is sincere. He knows the difficulties and the dangers, and he is honest with you. If, however, it leaves you with a clear understanding of everything and the dead certainty that you are going to get a thousand-for-one profit in the next two or three weeks, don't turn your money loose until you have kissed it. In after years, it will be a comfort to remember that you bade it an affectionate farewell. The phony salesman is the lad who makes you understand everything so perfectly that you believe oil "investment" is as simple a process as drawing money out of the bank. The other kind gives you a headache just trying to unravel his English when he talks about an oil "speculation."

But the cold facts remain—oil is flowing in South Louisiana, the tide is rising. New Orleans is a headquarters of large operations, has been for months, and will see a greater concentration of oil brains and oil capital in the months to come. Several field offices are already in New Orleans—more are coming; several big deals have been put over here, many are now in the making.

POISONOUS SNAKES OF LOUISIANA

(Continued from Page 11)

the fact that on the side of the head, almost halfway between the eye and the nostril, there is present a small but easily preceptible, pit, the function of which is still completely obscure.

The Pit Vipers of Louisiana may be divided into three groups. First, rattlesnakes of the Genus Sistrurus. This genus is distinguishable from the rattlers of the Genus Crotalus by the fact that the upper surface of the head between the eyes is covered with relatively large plate-like scales, whereas the other rattlers, belonging to the Genus Crotalus have the corresponding area of the head covered with very numerous, relatively small scales. Second are the rattlers of the Genus Crotalus. Here belong the largest and fiercest of all North American Rattlesnakes, the Diamond Back Rattler, and also the Timber Rattler or, as it is often called, the Cane Brake Rattler or Cane Braker. Third are two closely related species, neither of which possesses a rattle, the Copperhead and the Water Moccasin or Cotton-mouth These two species belonging to the Genus Agkistrodon, have the above described area of the upper surface of the head covered with relatively large plate-like scales, thus resembling the Pigmy Rattler. Descriptions of each of these snakes will be given later.

Poisonous snakes may constitute a real and very serious hazard, though fortunately they do not remotely attain here the dangerous character which they do in the large populations of India, where over 20,000 people die of snake bite every year. However, in the Gulf states they are definitely a danger, and are often present in unsuspected numbers. Thus, for example, in one tract of Florida, during the course of field work against the Mediterranean fruit fly, the men as a side line killed poisonous snakes, destroying the surprising total of 37 Coral Snakes, 965 Water Moccasins and 4389 Rattlesnakes. Poisonous snakes look after themselves quite competently, and, therefore, are seldom seen. A recent instance of this came to the writer's attention when in the course of clearing of swamp land along the Chef Menteur Highway (within the limits of the city of New Orleans), the workers, in a stretch of only 100 yards, captured five Rattlesnakes in a period of two days, although even a student of snakes, making a survey of the same area in its natural state, would, undoubtedly, have declared that not a single Rattlesnake was present. Only by the destruction of their cover was their presence revealed.

Many questions are popularly asked concerning snakes and many of the popular answers are utterly wrong. It will, therefore, be also a purpose of this brief discussion to attempt to answer, with accuracy, a few of these questions. There will be given some discussion of the treatment of snake bite, a subject concerning which again there is a bizarre mixture of fact and folk lore. Many of the common practices, far from aiding the patient, actually assist the poisonous character of the snake venom.

The Rattlesnakes, Cotton-mouth and Copperhead belong to that group of the serpents known as the Solenoglyphs. These serpents occur throughout temperate and tropical America. All of them bear their young alive, with the single exception of a very deadly South American species, the Bushmaster, *Lachesis mutus*, in which species the female lays a nest of eggs. Although they are termed pit-vipers, as a matter of fact, no true vipers occur in North, Central or South America. The true vipers especially flourish in tropical and south Africa.

The Harlequin Snake, known in Louisiana quite incorrectly by the name of Coral Snake, belongs to that group of serpents designated as the Proteroglyphs. This sub-family includes some of the most spectacular and deadly of all known snakes, and as a matter of fact, in Australia they so flourish that that continent is probably the only place in the world where poisonous snakes far outnumber non-poisonous ones.

SCIENTIFIC NAMES OF POISONOUS LOUISIANA SNAKES

The technical names of the poisonous snakes of Louisiana and their meanings are as follows:

The Harlequin Snake, *Micrurus fulvius* (Linnaeus). *Micrurus* is from the Greek, meaning "small tail", while *fulvius* is Latin, meaning "reddish-yellow".

The Copperhead, *Agkistrodon mokasen* Beauvais (Linnaeus). *Agkistrodon* is from the Greek, meaning "hook tooth", *mokasen* is from the Indian word "moccasin".

The Water Moccasin or Cotton Mouth, *Agkis-*

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trodon piscivorus (Holbrook). *Piscivorus* is Latin meaning "fish-eater".

The Pigmy Rattlesnake, *Sistrurus miliarus* (Linnaeus). *Sistrurus* is from the Greek, meaning "rattle" and "tail"; *miliarus* is Latin, meaning "of millet".

The Timber Rattlesnake, *Crotalus horridus* (Linnaeus). *Crotalus* is from the Greek, meaning "a rattle"; *horridus* is Latin, "dreadful".

The Diamond-back Rattlesnake, *Crotalus adamanteus* Bearvais. *Adamanteus* is Latin, meaning "diamond-like".

THE HARLEQUIN SNAKE

Of the Elapine Snakes, only a single genus occurs in the New World and of this genus, two species occur in the United States. One is the Harlequin Snake, *Micrurus fulvius* (Linnaeus), whose range extends from North Carolina to Florida and westward through the Gulf states to Mexico. Abounding in humid places, it is usually a docile species. The true Coral Snake, the Sonoran Coral Snake, *Micrurus euryxanthus,* is a more southwestern species, apparently limited in the United States to a distribution in the region between the Rocky Mountains and the Colorado River, southward into northwestern Mexico and California. Although inhabiting dry areas, this snake also typically lives underground. Two other Louisiana snakes may be popularly confused with the deadly Harlequin Snake, and for this reason, there is here given a description of the species concerned. If the reader remembers that the nose of the Harlequin Snake is black, whereas the two somewhat similar species have red noses, he can immediately identify the Harlequin. The Harlequin Snake attains a length of probably 18 inches to two feet. Its color pattern is startling, consisting of black followed by yellow, followed by red, the bands encircling the body of the animal, each yellowish band being bordered by two black ones. The head exhibits a yellow band across the center, with it a black ring. The yellow body rings are very narrow.

The Scarlet King Snake, *Lampropeltis elapsoides* (Holbrook) may conceivably be confused with the Harlequin Snake. In this species the red snout is followed by a white area, and the pattern consists of a design of two black bands, separated by an area of red and between each of these there is an area of white, so that black, red, black, white constitute the pattern. The black bands are about two scales wide, the red four to six or wider, the white one to two. This body color thus sharply contrasts with the Harlequin Snake's large rings of red and black, separated by narrow yellow rings. The Scarlet King Snake is a harmless and a beneficial species occurring from North Carolina to Florida and westward to the Mississippi. It appears never to be numerous.

The Scarlet Snake, *Cemophora coccinea* (Blumenbach) Cope, is the second species possibly to be confused with the Harlequin Snake. The head of this species is scarlet with a black band across the eyes. The dorsal surface is marked with large scarlet blotches surrounded by black bands, and between these black surrounded scarlet bands, there is a band of yellow. A docile species, the Scarlet Snake feeds on frogs, lizards and insects, and hides habitually under fallen logs. It occurs in Maryland southward to Florida, Alabama and Louisiana.

THE COPPERHEAD

The Copperhead has acquired more popular names than most of our poisonous snakes, being known as Highland Moccasin, Chunkhead, Death Adder, Pilot Snake and Poplar Leaf. The reader will observe that the specific technical name of this species is *mokasen,* although the Moccasin is a different snake. The Copperhead is a medium snake, averaging about two and a half to three and a half feet long. Ditmars records one specimen four feet, five inches in length. The Copperhead is a shy and secretive animal, evidently active chiefly at night. Its presence may thus remain unsuspected. One instance recorded by Netting near Pittsburgh relates that a farmer killed 49 Copperheads on his property in a year. The Copperhead ranges from southern New Hampshire to central Illinois, west to middle Kansas,

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and the Texas Panhandle and south through Texas to northern Florida. Copperheads have been known to eat mice, squirrels, shrews, birds, frogs, insects, salamanders and even opossums. The young are born in late summer and usually number four to nine. Like the young of the Moccasin, the little Copperheads have brightly yellow tails, the color of sulphur, which, when excited, they rapidly vibrate.

"Description: The dorsal surface is light brown and copper color, the head generally being bright copper, thus the name 'copperhead'. Darker brown blotches form dumbbells across the back, the contracted portion being over the vertebral column. Sometimes these brown spots do not continue and meet the one on the opposite side, or they may alternate. The ventral surface is a dull yellow with dark blotches on both sides" (Haltom).

THE COTTON MOUTH OR WATER MOCCASIN

The Moccasin is the most abundant of all our Louisiana poisonous snakes. Nowhere, has the writer observed them more numerous or larger in size than in flooded areas, where every protuberance may have its Cotton Mouth sentinel. The Cotton Mouth ranges from southeastern Virginia, south through Florida, north in the Mississippi Valley to southeastern Missouri, southern Illinois, west to central Texas, and up the Rio Grande to the Pecos River. It is one of the largest of our North American poisonous snakes, and may become heavy bodied. Four feet is a frequent length. The white appearance of the mouth when the snake prepares to strike has given to this species its common name of Cotton Mouth. "Congo" is another popular name used both by Creoles and Acadians in Louisiana. The writer has observed that much popular confusion exists with reference to the numerous, non-poisonous water snakes, for in spite of the dissimilarity in appearance, many people believe the water snakes (various species of *Natrix*) to be a kind of Cotton Mouth. The three Crotaline characters of pit, cat-like eye and lance-like head, serve to immediately identify the Cotton Mouth. Its specific name *piscivorus*, "fish eater", is well earned. The Moccasin also eats amphibians and rodents. It is a highly poisonous, vicious species, and records of the Antivenin Institute of America indicate that it is responsible for most of the snake bite injuries in the Southern and Gulf states with the exception of Texas.

"Description: On the dorsal surface this snake is dark brown and black. It often appears to take on a muddy tinge. Crossing the body are about twelve to fifteen wide black bands inclosing the brown blotches, which become wider at each side. The head is solid dark brown or black on the dorsal surface. A yellow band extends from eye to neck. Above this band is a blackish streak. Ventral surface is yellow with blotches or brown. Tail is dark on both sides" (Haltom).

THE PIGMY RATTLER

The Pigmy Rattler, the smallest of our Crotaline snakes, belongs to the Genus *Sistrurus*. It displays on the upper surface of the head a formation of relatively large plate-like scales, resembling in this respect, both the Copperhead and the Cotton Mouth, and differing from the Timber Rattler and Diamond Back, in which two last named species the upper surface of the head is covered with numerous, relatively small scales. These points of difference are clearly shown in the accompanying illustrations. Commonly called also the Ground Rattler, this species feeds chiefly on frogs and small rodents. Its rattles are very small, and their sound feeble. Wide in distribution, it ranges from southeastern North Carolina, south to Florida, west through eastern Texas and Oklahoma, and north through Arkansas to southern Missouri. It is, by preference, a snake of dry ground, living among leaves in the grass, but the writer has observed it also in wet land. In spite of its small size, it is quite poisonous, and several instances are known of the death of young people due to the Pigmy Rattler's bite.

"Description: Brownish, gray to ground color on dorsal surface. There are between thirty-eight and forty-five darker blotches on back from head to tail. A narrow black band encircle blotches. A dark streak with a light streak beneath extends from below center of eye to angle of mouth" (Haltom).

THE DIAMOND BACK RATTLER

The Diamond Back Rattler is the largest of all North American rattlesnakes. Correspondingly, it is also the deadliest. Should the victim struck by a Diamond Back survive, often extensive permanent damage remains. The Diamond Back

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ranges from southern North Carolina southward to Florida Keys and westward to the Mississippi River. Vicious, it is also brave, and will advance more often than retreat from danger. Remarkably accurate in its aim, the Diamond Back seldom misses. Altogether, it is a seriously dangerous creature. The Diamond Back feeds chiefly on rabbits, and for some reason, as far as it is known, does not feed on birds.

"Description: Gray to brown on dorsal surface, with very distinct diamond markings which are much darker, often black. These are bordered by yellow, generally about one scale wide. The tail does not have the characteristic diamonds as they fuse to form cross bands" (Haltom).

THE TIMBER RATTLER OR CANEBRAKE RATTLER

The Timber Rattler is a particularly beautiful species, attaining usually a length of about four and one-half feet. The writer has noted, however, one specimen, from Buras, Louisiana, that was six and one-half feet long. A wide range exists in the coloration, the dorsal surface being yellowish-brown, sometimes dark brown, crossed by transverse V-shaped bands of darker brown to black. These chevron-like bands are bordered with black and then yellow. The ventral surface of the Timber Rattler is yellowish-green, with dark blotches. Cane-brake Rattler, Banded Rattler, and Velvet-tail Rattler are other names popularly applied to this species. Wide in range, the Timber Rattler occurs from Maine to Georgia, and westward to the Great Plains. It is a dangerous snake, although it usually rattles before striking. In one instance, an 18-year-old girl, struck by a four and one-half foot Timber Rattler, died within thirty minutes. The writer kept a four and one-half foot Timber Rattler under observation for several months, during which time the snake rapidly became so familiar with its surroundings, that it would only rattle when a stranger appeared. This specimen captured near Houma, was particularly beautiful in coloration, and fed readily on white rats, which it struck and killed. The Timber Rattler is readily distinguished from the Diamond Back by the shape of the chevron-like dark bands, the darker markings of the Diamond Back being, as the name of the snake indicates, diamonds instead of V's. The Timber Rattler in nature, feeds extensively on rabbits and rats, sometimes on birds. Although it is fond of haunting ledges in woody and hilly districts, it also is found even in swamps.

"Description: The dorsal surface is a yellowish-brown, often dark brown, crossed by transverse 'V' bands of a darker brown to black. These stripes or bands are bordered with black and then yellow. Head is uniform from above. Tail is dark brown to black in adults. Rattles large. Ventral surface yellowish green with dark blotches" (Haltom).

REDUCING THE DANGERS OF SNAKE BITE

As Dr. Afranio do Amaral (1927) has well observed, measures to prevent or to reduce the danger of being bitten by snakes may be summarized in the following categories:

First, the prevention of snake bite through the protection of the individual, such as the practice, necessary in heavily snake infested countries, of wearing shoes and heavy leggings. Even such means, however, do not afford complete protection, since certain species, for example, the Timber Rattler and the Copperhead, are fond of haunting ledges, and the hands of a climber may thus easily come in contact with them. Similarly a wading fisherman may encounter a Cotton Mouth at such a level that the snake can strike above the protection afforded by the rubber wading boots. Leather puttees, for most species of snakes, give substantially the most adequate protection.

The second method, as do Amaral indicates, is that of collective protection. This consists either of systematically ridding an area of poisonous snakes by a program of extermination or by capturing such snakes alive and keeping them for the manufacture of snake anti-venin, or the rearing of the natural enemies of snakes. The former method mentioned has been practiced on a large scale in India, whereby offering rewards, extensive destruction of poisonous snakes was accomplished. The method, however, failed because of the impossibility of completely destroy-

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ing cover in which snakes can find shelter. The second method is that followed for many years in Brazil, as has been elsewhere described. It serves two excellent ends: first, the removal of the poisonous snakes from the area, and second the production systematically of anti-venin. The third method has never been found to succeed. The mongoose imported into the West Indies to destroy poisonous snakes developed a disastrous preference for poultry. Certain snakes, such as the Black Racer and the King Snake happily destroy other snakes, but the difficulty of increasing their numbers and the fact that they can find so much other food material make impossible the use of such beneficial snakes in any effective program of poisonous snake extermination.

EMERGENCY TREATMENT OF SNAKE BITE

The treatment of snake bite should be directed to prevent, as much as possible, the distribution of the snake poison through the victim's body, and the removal of as much of the venom as is possible. The common treatment of administering whiskey or other alcoholic drinks to the person bitten is precisely the wrong thing to do, since the effect of alcohol is to cause increased circulation. The pain and anxiety caused by a snake bite increase very disastrously the dangers to the patient. When there is added to the difficulties the fact that the person struck is often alone and far from assistance, the dangers are very real. The chief thing to do, when bitten by a snake, is to keep cool, and set about, as methodically and instantly as possible, the treatment of the wound. Where possible, if bitten in the arm or leg, a tourniquet should be applied. This can be hastily improvised by knotting a handkerchief and twisting the handkerchief tight with an inserted stick. The pressure should be released at intervals, to permit the flow of blood, since otherwise, serious results due to the stoppage of the bloodflow may follow. The site of the wound should be gashed with a razor blade or a knife, and a flow of blood induced. This will aid in washing out venom from the wound. The punctures made by a snake's fangs are small, and automatically close so that a deliberate cutting will be necessary. As is well known, it is quite possible for a person having no injuries in his mouth to suck the snake bite wound and remove the poison in this way. Devices are also available on the market which aid in this process by a modified vacuum pump action. However, mere sucking of the wound by mouth is, though primitive, a highly effective aid. The common practice of introducing potassium permanganate crystals into the wound is emphatically stated by eminent medical authorities to do more harm than good. The potassium permanganate is supposed to destroy the chemical constitution of the snake poison, but it must be remembered, that at the same time the potassium permanganate will definitely destroy the tissues of the patient. Dr. George Fasting, of the Louisiana State University Faculty of Medicine, has informed the writer that he strongly advises the injection of adrenalin around the site of the snake bite. Such treatment has the very beneficial effect of reducing the rate at which the poison passes into the blood stream, and the impact of the shock upon the patient's system is thus lessened.

Best of all the treatments for snake bite is the injection of antivenin. Antivenin completely ready for injection can be secured in any large center, and may even be in the stock of drug stores in remote towns. The beneficial effects of antivenin are of course profoundly increased if the injection can be made within a few minutes of the injury, but it must also be remembered that injections of antivenin, even many hours later, are very helpful. R. H. Hutchison has ably set down (1929) the following directions for the treatment of snake bite.

DETAILS OF SNAKE BITE TREATMENT

These should be read with care by every one exposed to the hazard of snake bite, since the knowledge and practice of these simple directions may result in the saving of human life. Because of its peculiar effect, snake bite is a particularly terrifying emergency, and only a cool command of sound methods will make possible intelligent first aid.

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"WHAT TO DO WHEN BITTEN

"1. Apply a ligature or tourniquet a few inches above the bite. For this purpose use a rubber garter, a piece of small tubing, a handkerchief, cord, or even a shoe-string. Do not bind the limb too tightly, but just tightly enough to retard circulation returning through the veins toward the heart. The sole object of the tourniquet is to delay absorption of the poison into the general circulation, but if it is applied too tightly or kept on too long, gangrene is likely to set in, with resulting destruction of the flesh in the affected area. It is important, therefore, to release the tourniquet every 10 or 15 minutes for about a minute at a time.

"2. If you have Antivenin with you, read carefully the directions on how to prepare the syringe and how to make the injection. Remember that venoms of North American snakes are usually slow in acting. Do not allow fear or agitation to make you overlook important points.

"3. When the syringe has been made ready, proceed at once to inject the entire contents of the syringe under the skin.

"4. The tourniquet should then be released.

"5. If the bite has been inflicted by a large snake, particularly by the Texas Rattler or the Florida Rattler (the Diamond Back), and if the symptoms are severe and develop rapidly, the Antivenin treatment should be supplemented by incision and suction.

"OTHER FIRST-AID MEASURE

"6. If Antivenin is not at hand, there are only two other first-aid measures that have proved of value. These are incision and suction, both of which have been used in Texas in cases of bites inflicted by the Western Diamond-back Rattlesnake. Make a cross-cut incision at each fang mark. For this purpose use a sharp, clean knife or razor blade and make the cut all the way through the skin, that is, about one-quarter of an inch deep and one-half inch long. This allows some of the poisonous fluids to escape.

"The removal of toxic fluids may be increased by applying strong suction over these incisions. The suction may be done mechanically if some apparatus, such as a breast pump, is at hand. Suction should be continued for 20 minutes out of each hour over a period of fifteen hours.

"7. In any case obtain the best medical attention as soon as possible.

"DONT'S

"Don't run or get overheated. Don't take any alcoholic stimulants. Circulation, increased by exercise or by alcohol, serves to distribute the poison much more rapidly through the body. Don't injure the tissues by injecting potassium permanganate, which is now known to be of no value as an antidote. Do not depend upon snake bite 'cures' or home remedies commonly used. They are of no value. Do not cauterize the site of the bite with strong acids or the like.

"FOR THE PHYSICIAN

"SPECIAL DIRECTIONS

"If the victim has not received an injection of Antivenin, it is important to inject the contents of one syringe as soon as possible. At the same time, release the tourniquet, if one has been applied.

"Repeat the injections every one to two hours unless and until symptoms are markedly diminished. In order to hasten the absorption of the serum, intramuscular injections are advised, and, in severe cases and those seen late, intravenous injection is recommended. In small children, when intravenous injection is difficult, the Antivenin may be given intraperitoneally. In shocked cases, physiological salt solution intravenously and blood transfusion are supplementary measures of life-saving value. For weak pulse and threatened heart failure give caffeine or strychnine.

"If incisions have been made at the site of the bite, the wounds should be irrigated with a one

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or two per cent salt solution (not normal saline). The application of strong suction may be continued over these incisions, if the symptoms and condition of the patient indicate the necessity of pushing the treatment. Otherwise, apply a hot application of 1:10,000 mercury bichloride or a strong magnesium sulphate solution.

"EXTRA PRECAUTIONS

"It sometimes happens that after the first shock and reaction has passed, the patients will show a marked improvement. Some fatalities from snake bite are plainly caused by an undue sense of security following the observation that most patients do well for the first 15 hours. Even though the general symptoms may be mild, it is important to keep the patient under close observation for at least 24 hours, and active treatment should be continued as long as the swelling is progressing. Repeat the injections of Antivenin every one or two hours if the swelling is increasing. The danger is always in under-treatment rather than in over-treatment.

"In treatment of snake-bite in children it is important to double the initial adult dosage. The reason for this is that a mathematical relation exists between the weight of the body and the amount of venom which it can normally neutralize and dispose of without serious injury, although the amount injected by the snake is approximately the same. The smaller and lighter the body of the victim, the less venom it can withstand, and the greater the excess of venom over the normal body resistance. Therefore, if the victim be a young child, there is much more venom requiring neutralization by the serum."

Snakes, poisonous or harmless, will continue to be sinister objects of human interest as they have always been since the days of Eve and of Cleopatra. It is hoped that this discussion of our Louisiana poisonous snakes will serve to provide definite information concerning the identification of these often dangerous creatures, and the correct treatment of snake-bite. With the increased popularity of the out-of-doors, and the familiar frequent family picnic expeditions into areas where poisonous snakes occur, the need for accurate knowledge of what to do in snake-bite emergencies has greatly grown. The Bureau of Research, Department of Conservation, will be glad to cooperate in the identification of any specimens of snakes living or preserved submitted to it. Such specimens should carry the precise statement of the place and time of capture. There will be found below, a list of useful, more or less general, works on snakes, together with a list of certain papers which have been cited above.

GENERAL REFERENCES

The following brief reference list includes, in addition to the papers cited in the above discussion, certain other general monographs useful to the student of Louisiana poisonous snakes:

Ditmars, R. L., 1908 (reprinted 1915, 1930), New York. Doubleday Page Co., New York. This is the most complete and most useful of the available publications for a student of our poisonous snakes.

Blanchard, F. N.: A key to the snakes of the United States, Canada and Lower California. Papers of the Mich. Ac. Sc., Arts and Letters, Vol. 4, pp. 1-65. This admirable and extremely comprehensive monograph gives technical keys, by the use of which any species of snake in the area covered may be identified.

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of the standard scientific illustrations of North American reptiles.

Beyer, G. E., 1900. Louisiana Herpetology. Proceedings Louisiana Society of Naturalists. 1897-99. Pps. 25-46. A comprehensive, though now old, list of Louisiana reptiles.

Haltom, W. L., 1931, Alabama Reptiles. Museum Paper, No. 11. Alabama Museum of Natural History. University of Alabama. This well illustrated bulletin of 145 pages covers both the non-poisonous and the poisonous snakes, as well as the other reptiles of Alabama, and is a useful work for the student of Louisiana herpetology.

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AN ALARMINGLY LARGE STURGEON

U. S. Bureau of Fisheries agent, West Jacocks, Columbia, S. C., has reported that a 220-pound sturgeon was caught near Columbia Canal Locks on Broad River a short distance above Columbia early one morning during the week of May 7. A colored man who was fishing in the canal thought that a log had caught in his fish basket, so he hitched a mule to the line and much to his astonishment when the mule hauled the basket from the water he found a large sturgeon. The negro not having seen a sturgeon was very much frightened. The mule was also frightened and with one loud bray he hauled the sturgeon well on the banks and then departed for parts unknown. Help soon came to the rescue of the fisherman and he loaded the fish, which measured 9 feet in length, in a wagon. It is very rare for a sturgeon to be caught in waters of South Carolina in the vicinity of Columbia.

—U. S. Fisheries Service Bulletin, June, 1934.

POACHING AT FEDERAL HATCHERIES

Scientific and technical reports showing the value of fish in the dietary are apparently taken seriously by a few individuals who appear to think that the easiest and simplest way of securing their fish is to poach them from the ponds of the U. S. Bureau of Fisheries hatcheries. Occasional reports of this occurrence are received, and there is one instance where the culprit is reported to have established himself in a creek bed below the level of the ponds in which some nice brood trout are being held. A line baited with a worm or some similar delicacy would then be thrown over the bank while the progressive angler remained concealed from the hatchery employees. This bait was readily taken by the trout, and the first outward indication aside from the gradual disappearance of fish, was noted when one of the fish appeared to be going overland over the pond embankment and descending into the creek.

The most recent classic of this nature was reported from one of the Eastern stations and it must be admitted that the report has not been definitely authenticated. At this hatchery there are numerous visitors and it is claimed that one gentleman clad in loose overalls spends considerable time in rapt admiration at the edge of the pond. His technique consists of running a short baited line down his overall leg and kicking it into the pool when the hatchery men are not in the immediate vicinity. The reaction of the trout is natural and obvious and when one takes his bait, the second step is to pull up the line through an open pocket, and the unwary trout is unceremoniously jerked into and up the camouflaging and commodious overall leg. The angler then strolls nonchalantly to his automobile and proceeds homeward to a good meal of trout since the fish in question are quite sizeable.

As stated above this report has not been credibly proven but in the future one of the duties of the hatchery crew will be to scrutinize carefully the contours of all overall-clad visitors.

—U. S. Fisheries Service Bulletin, June, 1934.

FISHERIES OF THE SOUTH ATLANTIC AND GULF STATES

The commercial catch of fishery products in South Atlantic and Gulf States in 1932 amounted to 298,950,847 pounds valued at $6,428,385. This is an increase of 3 percent in volume and a decrease of 20 percent in value as compared with the catch in the previous year. These fisheries gave employment to 21,560 fishermen or 9 percent less than in 1931.

Based on the value to the fishermen, shrimp constituted by far the most important product, amounting to 88,262,000 pounds, valued at $2,036,000. Following in order were oysters, 15,750,000 pounds of meats, valued at $711,000; sponges, 613,000 pounds, valued at $697,000; mullet, 25,087,000 pounds valued at $417,000; red snapper, 6,359,000 pounds, valued at $315,000; spotted squeteagues or "sea trout", 6,239,000 pounds, valued at $298,000; and shad, 1,882,000 pounds, valued at $239,000.

Florida led the other States in this area with respect to value of production accounting for 102,324,000 pounds of fishery products, valued at $2,973,000. Following in order were Louisiana with a production of 48,340,000 pounds, valued at $1,181,000; North Carolina 86,214,000 pounds, valued at $827,000; Mississippi, 20,603,000 pounds, valued at $497,000; Texas, 14,304,000 pounds, valued at $472,000; Georgia, 16,523,000 pounds, valued at $186,000; Alabama, 6,107,000 pounds, valued at $169,000; and South Carolina, 4,536,000 pounds, valued at $123,000.

—U. S. Bureau of Fisheries.

Louisiana Nature Guardians

"Upon my honor, as a Louisiana Nature Guardian, I promise to take care of all our natural friends, to guard and protect them to the best of my ability, and as far as possible influence others to do the same."

HOW YOU CAN BECOME A NATURE GUARDIAN
YOUR PART

Consult your teacher.

Ask that the purpose and plans of the Nature Guardian Club be explained to you and the class.

Ask for an application card.

Get a responsible person to indorse it, after proving that you fully understand the duties of a Nature Guardian.

Sign the application and mail the card postpaid, or give to your teacher, to send with cards from all the class.

OUR PART

We send the application card.

We send you a handsome badge, a certificate of membership, Nature Guardian pamphlets, and other literature.

This is all free, and is carried on with the purpose of instilling in the children's minds a knowledge of Louisiana's wild life and a thorough understanding of its economic value to the State.

It also aims to develop individual humanitarianism. Even with in this short time an amazing improvement has been made in the mental attitude of our young folks toward the conservation and protection of Louisiana's natural resources.

EDITORIAL

My Dear Guardians:

Louisiana is particularly fortunate in possessing several wild life sanctuaries within whose precincts the migratory bird life is absolutely protected. It has been proven, that, given such protection, these birds will return year after year, to the spots where practical conservation methods insure their obtaining food and protection.

I wonder how many Guardians know that the first wild life refuges established in the world, were gifts to Louisiana by Russell Sage Foundation and Rockefeller Foundation, the State of Louisiana accepting these properties as a sacred trust. This is something to make us all proud.

Under the present Commissioner of Conservation the State refuges have reached a standard of supervision, protection and control never before equalled in the history of these sanctuaries. Although much has been done by our Department to insure a safe and happy home for our winter visitors, still there is much to be done by teachers, Guardians and all lovers of Nature.

A noted Illinois educator says, very rightly, that the teachers of our nation must create a refuge—a sanctuary—in the hearts of the children; that unless our wild birds continue to nest and rear their young in the hearts and sentiment of the youth of our nation we shall soon miss their beautiful songs and plumage from the tree tops; and that refuges will have little meaning unless there have been built homes for the birds in the love and appreciation of school children.

So, my dear Guardians, keep your pledge well in mind during these long vacation days, and do your part to help preserve Louisiana's reputation for being a "bird Heaven as well as a bird Haven."

Wishing all the Guardians a happy vacation,

The Editor.

Evergreen, La.

Dear Editor:

I have been wanting to join your "Louisiana Nature Guardians" for a long time. I think Louisiana has a wonderful supply of wild life. I love to watch the beautiful bright red cardinal, the blue jay, and hear the mockingbird sing.

I live out in the country and often take long rides among the naturally beautiful spots near my home. There is a little bayou called "Bayou Rouge" near by, where crayfish abound. On its banks are many tall weeping willow trees. There are many large magnolia trees, with lovely white blossoms, too.

You can tell there are many trees in my home town and all around it by its name, "Evergreen". Long ago, when they were trying to decide on a name, "Magnolia" and "Evergreen" were suggested. "Evergreen" won out, because there were so many green bay trees here.

I would like to hear from some of the Guardians, I am sure I shall like the Club very much.

Yours truly,

Mary Louise Pearce.

This is an interesting account of how the town of "Evergreen" got its name. I wonder how many Guardians know the history of their towns!

Lena, La.

Dear Editor:

I like the "Louisiana Conservation Review" very much. I want to be a Guardian, so please send me an application card.

I am nine years old and I am in the 6th grade. Hoping to hear from some of the Guardians, I am,

Yours truly,

Juanita Wise.

I hope some of the Guardians will write to Juanita, and welcome her into the Club.

"SHANTY-BOAT"

By the side of the Bayou you'll find it
Peacefully nestling there,
The shanty-boat of the trapper
Caught fast in the lily's snare.

At twilight, when nearing this haven,
Something awakens the heart,
It is only the home of a trapper,
But, to me, a beautiful thought.

"Bayou Willie."

LOUISIANA BIRDS

By Carl Jones
Atlanta, La.

Louisiana has many important, useful and beautiful birds, among which some are resident, some are migratory. When the birds are building and hatching they ought to be protected more than at any other time. Everyone, especially bird hunters, should think about this, and try to protect the birds to the best of their ability. Nature Guardians should do all in their power to help protect the birds of Louisiana.

Miss Reppert is a faithful, all-the-year-round worker. We appreciate her fine cooperation.

2120 Carlton Ave., Shreveport, La.

Dear Editor:

This year I had a Nature Guardian Club in my 6th grade room at Greenwood. I am now at home for my vacation and would like to start a Nature Guardian Club for my neighborhood children this summer.

Please send me 25 application cards, and any literature that you think will help me with the Club.

Sincerely yours,

Billy Lou Reppert.

There should be much enthusiastic work done at camp this summer by the Guardians. We believe that will be the case at Peter Pan Camp near Franklinton, La., by these girls and their supervisor:

Franklinton, La.
May 28, 1934.

Dear Nature Guardian Editor:

The Girl Scouts of Franklinton met at Peter Pan Camp last Friday to spend the day. We decided to make a change to Louisiana Nature Guardians, with Mrs. John M. Love as sponsor.

Twenty-nine girls signed the pledge. All were very much interested. We have planned to do a great many interesting things this summer.

We are planning to make a scrapbook to use the whole year. When we make a visit to New

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Orleans we shall bring them to you as an exhibit. The Washington Parish Fair is held at Franklinton every year. Mrs. Love is going to try to have us Guardians arrange an exhibit with our specimens and notebooks.

We have arranged ourselves in four groups, according to our grades. Each group is named for a tree. The OAKS are the pupils of the first and second grades. The MAPLES are the pupils of the third and fourth grades. The MAGNOLIAS are those of the fifth and sixth, and the BAYS are the pupils of the seventh grade and all of the high school grades.

In the lodge at our camp we found a little wren's nest with four tiny eggs in it. We are going to take good care of it, and see that nothing happens to it.

Our camp will commence the 3rd week in June at Peter Pan. While we are there, please come to see us. We can promise you a good time.

With love,

Your Two Nature Guardians,
MARGUERITE AND JEAN MCGEE.

FLOWERS

BY H. B. WEILAND, JR.

Beautiful and fragrant are the flowers.
Flowers grow in the land of beauty and love.
For a land could not have love
Without flowers so beautiful and bright.

Flowers come from Heaven so fair.
Flowers are made by Almighty hands.
Made so beautiful and free from all evil—
Flowers in their bright settings of green.

Flowers are made in Heaven.
Beautiful are they.
Kissed by the lips of Heaven—
Kissed by Heaven's dew so clear.

Flowers are made in Heaven.
Made by our Father who all things maketh well.
Planted in the earth so far below—
Loved by man in the world of beauty and love.

We are glad to have Helen become an honorary club member, and hope some of the Guardians will write to her way off there in South Carolina.

McClellanville, S. C.

Dear Editor:

I have been reading the "Louisiana Conservation Review" and as I love birds and outdoor life, I have decided I want to become a Nature Guardian. Please send me an application card.

I am fourteen years old, and in the 10th grade.

Hoping to hear from you soon, I am,

Yours truly,
HELEN LEGARE.

Perry, La.

DEAR EDITOR: We are sure that you think we have forgotten all about the Club, but that is really not the case. We have just neglected to write. We received our certificate in 1931. We have protected birds, squirrels and other animals.

Your true Guardians,
REGGIE A. SORBET,
LAWRENCE NOEL.

Here is a bird poem that these boys sent in:

THE WOODPECKER

The Woodpecker sat on the limb of a tree
Pecking for a worm he wished to see.
Mother was sitting on the nest near by—
"Look!" cried Daddy, as he winked his eye.

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Here is a lovely letter from the little tots in the Second A Grade, C. J. Colton School, New Orleans:

DEAR EDITOR: The Nature Guardian certificates and badges came to us by mail. We are very proud of them and we want to thank you for sending them.

SECOND A GRADE.

Here is a poem by P. M. Davis, Jr., which is very rightly entitled:

"CONSERVATION"

Not a place in the universe is to be found
Like the State of Louisiana, where abound
The bayous and lakes, and all their charms
Come to you with open arms.

Our natural resources are very great—
Gas and oil are at our gate;
Many places have been found
Where sulphur is taken from the ground.

All our wild life, and fishes, too,
In forest and stream are calling you.
Do not use all we have, along the way—
Save for those who will follow some day.

Fish and wild life may be replaced—
Our forests may be, too—
But gas and oil take a million years
Before they come to you.

As you travel along life's way,
Remember the poem you read today—
Don't waste our natural resources, whatever else you do,
But always, ALWAYS remember, what CONSERVATION means to YOU!

The Nature Guardian Editor regrets that the allotted space will not permit the publication of the voluminous contributions submitted, and which are so uniformly excellent that selection is a difficult task. We also call attention to the fact that often it is necessary to do quite a bit of editing in order to fit material to our needs.

SIMULTANEOUS CAPTURE OF TWO OTTERS IN SINGLE TRAP

A trapping incident of an exceptional nature has been reported to the Department of Conservation by Mr. Benjamin Loga of Pilottown, Louisiana. Mr. Loga is a brother of Mr. Ellis Loga, the engineer of the Research boat "Black Mallard".

While engaged in trapping operations on the east side of Redfish Bay in the month of January, 1934, Mr. Loga had the remarkable experience of capturing two adult otters, *Lutra canadensis latazina* (F. Cuvier), in a single trap at the same time. The animals, which were a male and female, probably representing a pair of otters engaged in hunting together, were caught by the inside front foot of each animal. Thus imprisoned, their violent nature asserted itself in a battle in which both animals were killed. Considering the brief interval of time between the springing and closing of the trap, which was of the Victor type, it is evident that the animals must have almost in the same instant made contact with the trap.

STATE PARKS

(Continued from Page 1)

The Federal government is making a sincere attempt to invest its money in relief-labor that will prove useful. All of us hope that prosperity will take care of our surplus labor-supply. But the outlook is that this Federal relief will have to continue for some time. It has done amazing things with the New Orleans City Park. It might well be devoted throughout the State to the improvement of parks which could be created under a state commission.

In our judgment, there is need for co-ordination of the various state activities through some central body of this kind. The State Highway Commission touches phases of this problem in the building of roads. The Conservation Commission handles many phases of it. The State University, through its agricultural and other work, could do a great deal to facilitate State beautification. It has experts who should be available without cost of any kind to such a commission.

We trust that the members of the Legislature will consider and act on this idea on its merits.

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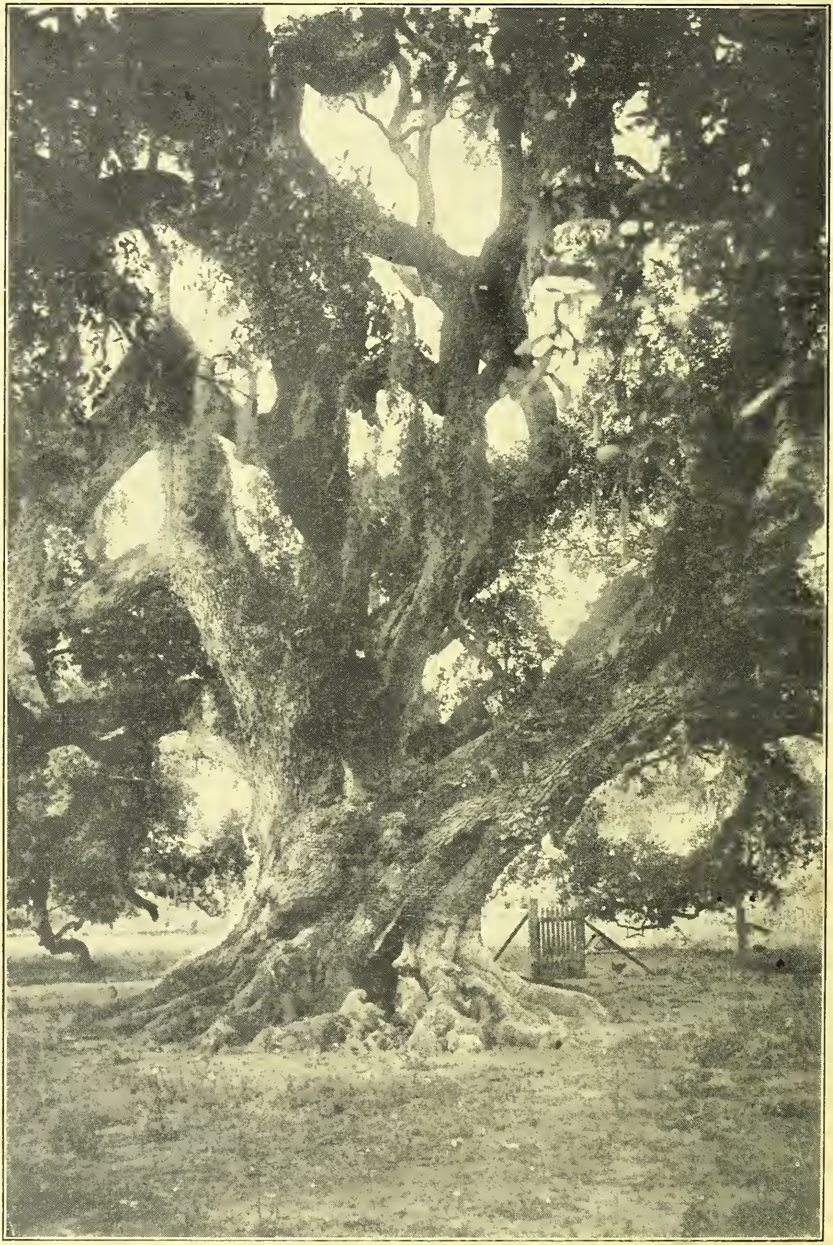

Vertical Close-up of the Locke Breaux Live Oak, on the right bank of the Mississippi River, four miles above Hahnville in St. Charles Parish, Louisiana—just across the river from the great Bonnet Carre Spillway, and about a hundred yards below the mast of the "High Line" which crosses the river at that point. Photograph by Dr. E. L. Stephens, President, Southwestern Louisiana Institute.

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